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DoubleHelix

BRING BACK QUOLLS!

Space clouds

Cute baby bats

ANIMAL RESCUE

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DoubleHelix
BRING BACK QUOLLS!
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ANIMAL RESCUE

ON THE COVER

Time for an animal rescue! Come with us as we go to a baby bat hospital (page 16) and meet the team that's bringing the eastern quoll back to the Australian mainland (page 18). For another take on animal preservation, we visit Australia's frozen zoo (page 14). And for something completely different, we take a look at 2 clouds in the night sky that are really galaxies (page 24).

Ready to get hands on? Why not do an echidna investigation and help real scientists (page 29)? Or discover the secret that keeps sharks from sinking (page 32). Plus, you can discover how baby birds breathe while they're still in their eggs (page 30).

CSIRO

CSIRO works to protect people and the planet. Check out how we're fighting climate change with cow food (page 7). And meet our new robot, designed to keep an eye on nuclear reactor fuel (page 5).

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Image: ©iStock.com/Pleio

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Special thanks to the year 5 students and teachers at Kaleen Primary School for sharing their ideas for this magazine.

David

HELIX HQ

Welcome to our animal rescue issue! Inside the magazine we'll meet all kinds of scientists and experts trying to rescue our native wildlife. From freezing DNA to raising babies, they're all making a difference.

When I got my first job at CSIRO, I saw that lots of lizards liked to sun themselves on the driveway into work. I often had to run out to make sure the lizards didn't get run over. I had to go save a few humans from getting attacked by angry lizards, too.

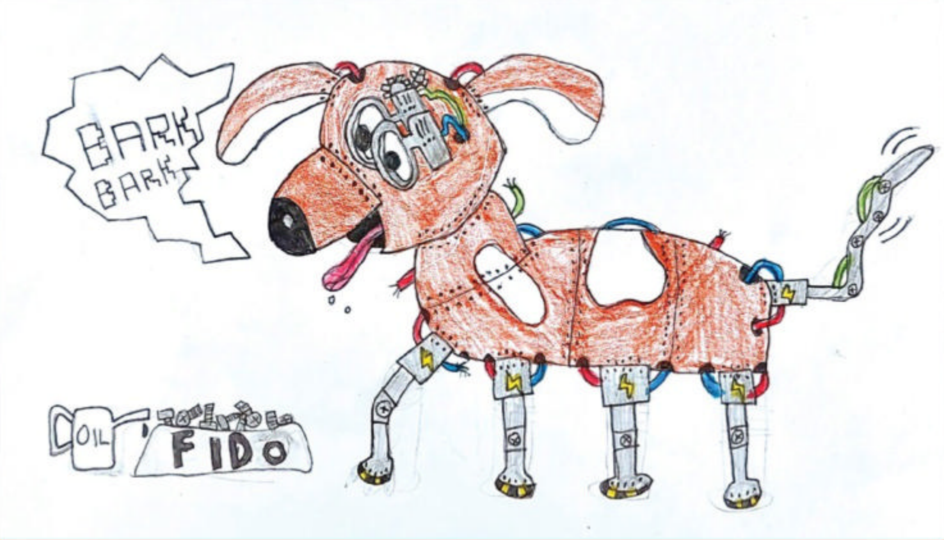
One sad day I saw someone hitting a lizard with a stick. I took the lizard to the RSPCA but they couldn't do anything to save it. I was really upset, but the next day, I still had to chase the lizards off the driveway.

Not every rescue is a success, but it's important to try. Building up a lot of little successes is the best way to make a real difference.

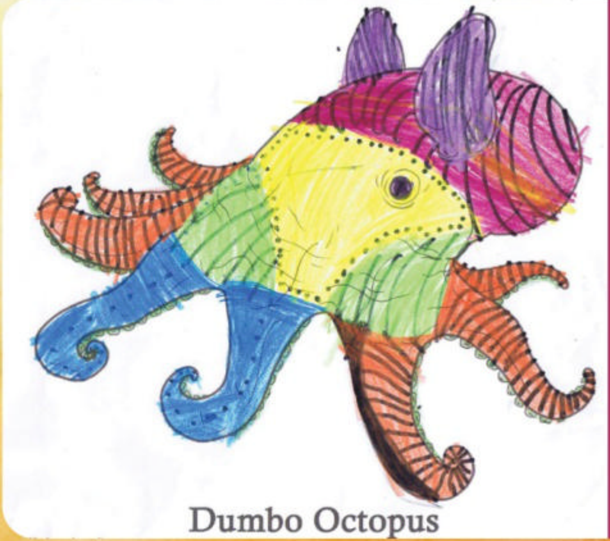
ON THE DOUBLE

Double Helix readers went nuts and bolts over our Artificial Intelligence issue, sending us an abundance of colourful drawings and poetry.

For more competitions and creativity, head to page 38. You could win a Creatures of the Deep coin collection from the Royal Australian Mint, and learn all about the unique species CSIRO scientists research on the RV *Investigator*!



Your robot dog is a real character, Rory – full of artificial intelligence



Such beautiful colouring-in, George. It's so bright it must be warning predators to stay away!

Here are a few of the funny original robot jokes from our readers

Madeleine

Q: Why do robots always know what's happening in the theatre?

A: They understand the program

Darcey

Q: What robot is very small, old and has white hair?

A: A Nanna-bot

Zac

Q: Which robot doesn't talk much?

A: A shy-borg

Hamish

Q: What did the human say to the robot?

A: AI like your thinking (hey, I like your thinking)

Image: ©iStock.com/EXTREME-PHOTOGRAPHER

Stingrays make clicking sounds

CLICKING RAYS

Stingrays were previously thought to be silent members of the oceanic world. But marine scientists have discovered that the creatures make clicking noises.

The noises sound a little like a beep from a video game. The scientists used handheld underwater cameras to pick up the sounds in Australian and Indonesian waters.

One of the researchers, Lachlan Fetterplace, dropped his camera after being startled by a passing clicking stingray.

"This just shows we don't know everything," he told National Geographic magazine last year. "We're in the year 2022, and you can discover something no one has ever seen just by going out and doing observations in natural history."

The researchers are still trying to figure out how the noise is produced. One idea is that the 2 holes on a stingray's head contract, which creates friction, and therefore sound.

"This is not unlike when we snap our fingers," Lachlan says. "It's also possible the rays are forming sounds by creating a vacuum, like when we click our tongues."

– By Heather Gallagher

CARVING COOL CABINS FOR CRITTERS

In the heat of summer, you might be tempted to cool off with a swim at the beach, or a sweet ice cream treat. But have you ever wondered how our native wildlife keep cool?

Many birds and small mammals, such as sugar gliders, shelter in tree hollows. The hollows develop naturally as the trees get older, but they can take at least 100 years to form. Meanwhile, existing hollows are getting harder to find because of bushfires and logging.

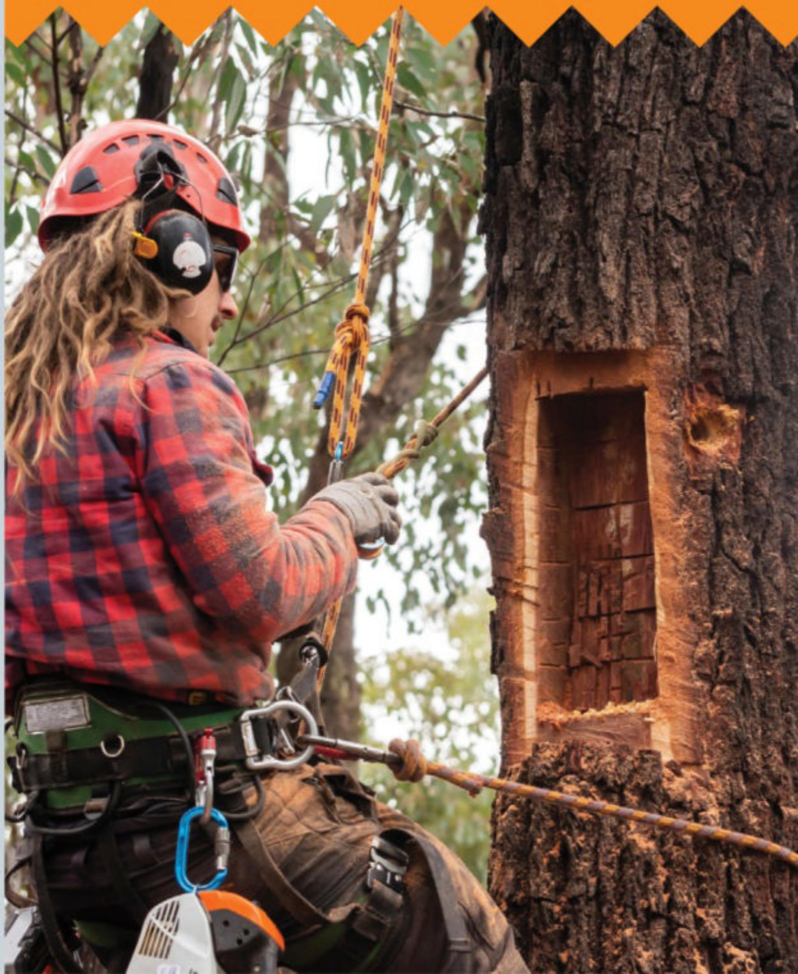
One alternative shelter is a small, wooden box on the side of a tree. But when it's hot outside, these boxes get hot too. The animals who call them home can then get stressed and dehydrated.

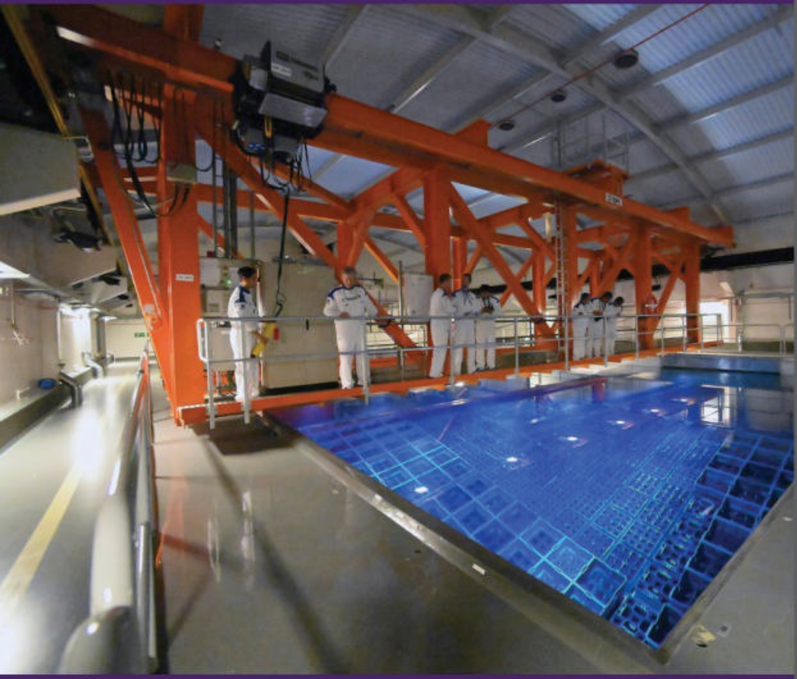
So, researchers have been testing out another option: carving hollows into living trees with chainsaws. These hollows stay much cooler than normal nest boxes. And they show how chainsaws could be good for conservation after all!

– By Lucy Campbell

When it's finished, this will be a cool home for hot wildlife!

Image: William Terry





The RCVD robot is designed to watch the nuclear fuel in this pool

Image: IAEA

ROBOTS KEEP NUCLEAR FUEL SAFE

When it's dangerous to send a human somewhere, you should send a robot. And not many things are more dangerous than nuclear fuel.

CSIRO has teamed up with robotics company, Datastart, and the International Atomic Energy Agency. Together, they have created the Robotised Cherenkov Viewing Device (RCVD).

The RCVD floats across ponds of nuclear fuel containers. It detects unique signals from each container, and can tell if they have been replaced or removed. Using software designed by CSIRO's Data61 team, the device plans its own route through the pool, creating its own maps as it goes!

Previously, inspectors had to stand above the pond to examine the fuel containers. Temperatures above the pool could reach 40 °C, making it uncomfortable and even dangerous.

"This new technology will remove humans from harm's way and ensure the rate of safety inspections," says CSIRO Program Manager Rosie Attwell.

– By Chenxin Tu

BY THE NUMBERS: THE KOALA GENOME PROJECT

– By Louise Molloy

10	The number of months it took to sequence the koala's DNA. Led by scientists in Sydney, a team of 54 researchers in 7 different countries completed the Koala Genome Project in 2018.
26,558	Koalas have this many genes. But which genes make this marsupial unique?
24	With this large number of 'bitter taste' genes, koalas can avoid eating the most toxic eucalypt leaves. Their leafy diet would kill most critters! Koalas need 600–800 grams of leaves per day.
55	The minimum percentage of water found in the leaves koalas choose to chew. It's where they get most of their water from. Their genome shows they can pick which leaves are the juiciest!
2022	The year the federal government declared that koalas were endangered in Queensland, NSW and the ACT. Understanding the koala genome will help us conserve them, including better treatments to tackle koala diseases.

Image: David Iliff CC BY-SA 3.0

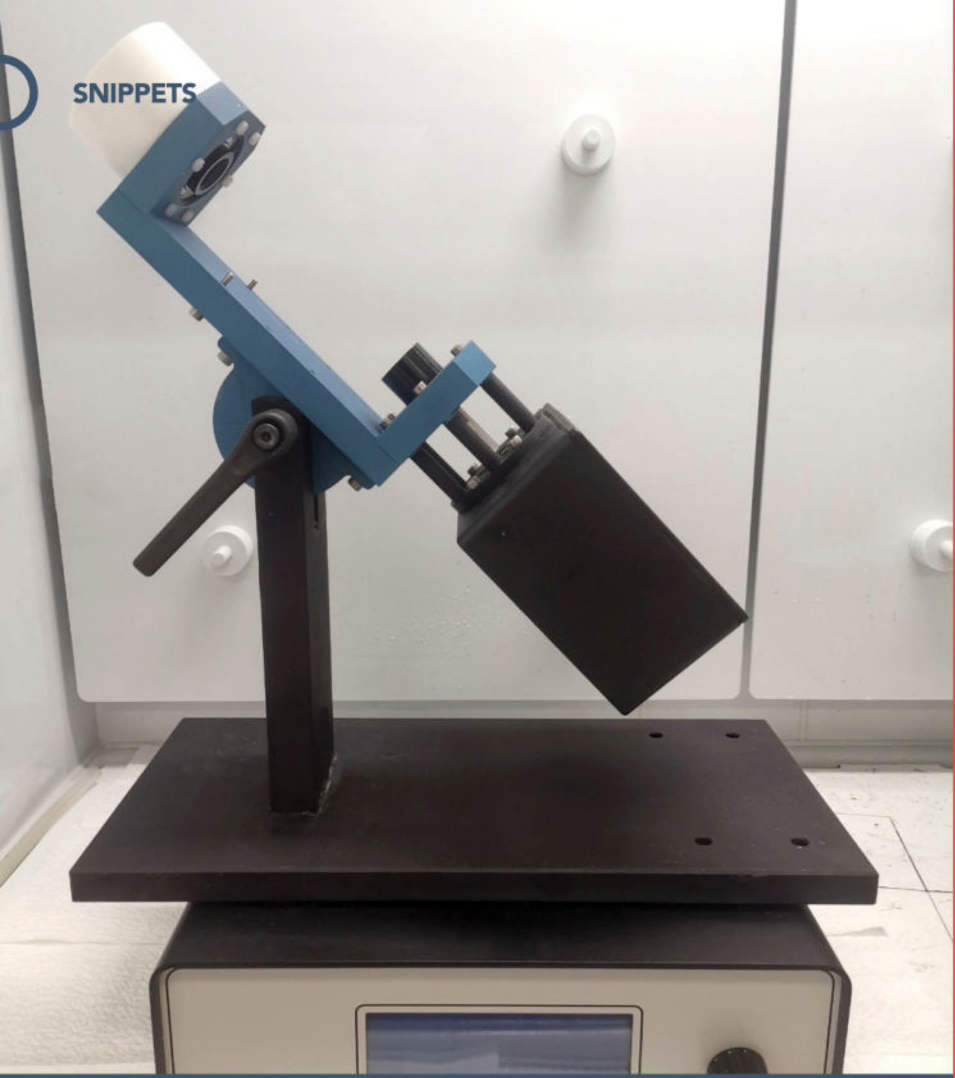


Image: Courtesy of Zoe Gardner

The vortex fluidic device spins so fast it turns cooked eggs raw!

UN-BOILING AN EGG

You can prepare eggs in many ways, from scrambled to hard boiled. But what about un-boiling them?

Eggs contain proteins that are folded in specific shapes and held together by chemical bonds. As an egg heats up, the chemical bonds break. The proteins unravel and collide with each other. Eventually, they get tangled, creating a solid boiled egg.

Professor Colin Raston's laboratory has discovered the trick to un-boiling an egg in 2 simple steps:

Step 1: Dissolve the boiled egg white in water and urea (a substance that helps the proteins slide past each other).

Step 2: Add the dissolved egg to a glass tube and spin it at 5,000 rotations per minute in a vortex fluidic device (VFD).

As it spins, the VFD flings the eggy solution against the sides of the glass tube. The solution nearer to the edge of the tube spins faster than in the middle of the tube. This speed difference causes the proteins to stretch and reform into their un-boiled shapes!

– By India Shackleford

HEARTLESS CHEATERS

To see a creature rescued
when it's trapped or in a fix
can make us feel care-happy.
But some videos are tricks.

Scenes like kittens cornered
by a very hungry snake,
then rescued by a human,
might be set-up, cruel and fake.

Some people film them just for 'likes'.
About the creatures, they don't care!
At first we smile, but was it cruel?
Think twice before you 'like' or share.

– By Celia Berrell

Image: ©iStock.com/Toxitz

The World Animal Protection website has tips on spotting fake rescue videos:

www.worldanimalprotection.org.au/news/how-spot-fake-animal-rescue-video

AUSSIE SEAWEED SOLUTION HEADING OVERSEAS!

A 'miracle product' developed by CSIRO that stops cows from burping and farting has gone international!

Methane is produced by cows, sheep and goats when they burp and fart. Methane from agriculture makes up more than 10% of Australia's total greenhouse gas emissions. CSIRO has been trying to develop a solution to this problem for almost 10 years. Now, for the first time ever, a homegrown product that can be added to animal feed is being trialled overseas.

The product FutureFeed contains a native Australian seaweed called *Asparagopsis*.

When it is fed to cows, the seaweed can cut their methane emissions by 80% or more. According to the researchers, if even just 10% of the world's farmers used the feed, it would be like removing around 100 million polluting cars from the road.

Early experiments also indicate that the seaweed might help cows grow faster or need less food. If that's true, it would make farming even more sustainable!

– By Cordelia Jerjen

An Australian seaweed can stop cows from making greenhouse gases

Image: ©iStock.com/Daniele Macis

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DoubleHelix

SUSTAINABILITY SQUAD

BY CHENXIN TU

Protecting the environment isn't just for scientists and grown-ups. Anyone can help, and our Sustainability Squad can show you how. You can learn from these *Double Helix* readers and be an everyday hero, too!

BEACH RESCUE

Millie picks up litter to protect the beauty of her local beaches

"Experts say that by 2050, there will be more plastic than fish in Earth's oceans and seas."

This terrifying prediction is what drives 10-year Millie from Western Australia. Millie has been on a mission to clean up her local beaches and save her beloved sea creatures from plastic waste.

"I started regular beach clean ups in a coastal clean-up group on 8 August 2020," she says. "After hearing how passionate I was about the environment, one of the people in the group interviewed me to create a video about how plastic can hurt our oceans, and my tips on what people like you can do to reduce waste and keep our oceans clean."

With just a bucket and some tongs, Millie has picked up hundreds of pieces of rubbish. Being a good scientist, Millie has also been recording the types of litter she's collected throughout the years. And she's spotted some important changes.

MAKING CHANGES

With her love for sea creatures and beautiful coastlines, Millie hopes to do more than just pick up rubbish.

"The Western Australian Government's recent single-use plastic straw ban has drastically reduced the number of straws found lying on the beach," she smiles. "My future step is to contact local politicians to show that the number of straws in the ocean has reduced so much, and encourage the government to expand their plastic ban campaign."

By joining the Sustainability Squad, Millie hopes that more people can join her in picking up litter around us.

"Every piece of rubbish you pick up, whether it's a plastic bag, a microplastic or a straw, could save an animal's life," Millie says.

One of Millie's litter hunt findings

GROWING A FUTURE

From planting trees for wetlands to running school-wide recycling programs, 9-year-old Tallulah from Balnarring Primary School in Victoria is helping her community towards a greener future.

Tallulah is one of our 2022 Sustainability Squad winners. Her sustainability journey began with her school's environmental action club, where she worked with other students to plant native plants in local wetlands.

"It is devastating knowing that there are animals losing their homes and becoming threatened," says Tallulah. "I really want to do everything I can to help."

Bringing their school together, the club planted 100 trees on a piece of cleared land. With this, Tallulah is helping her community rebuild homes for wildlife.

Tallulah helps plant native bushes and trees

SAVING SOLES

Tallulah's also on the lookout for new ways to recycle familiar products.

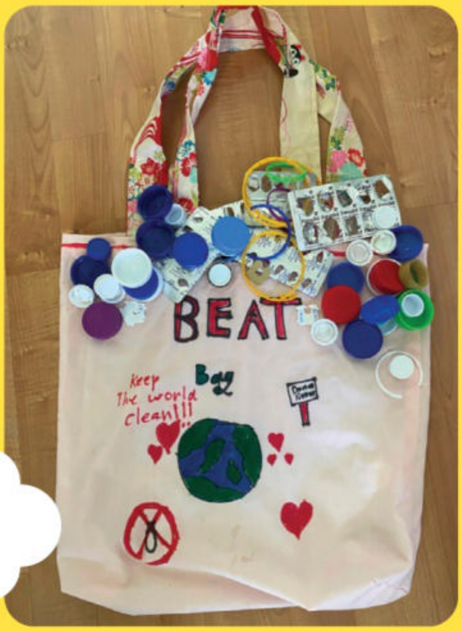
"Our school participated in TreadLightly, a program that collected unwanted shoes for recycling," says Tallulah. "Our community collected 798 pairs of shoes and won the national prize!"

The TreadLightly program remakes unwanted shoes into sports equipment, such as gym mats and playground equipment. They are true 'sole-saving' enthusiasts!

A BAG OF GOODIES

Recycling is easy when the proper bin is right there. But how do you encourage recycling when that's not the case?

Working with her school environmental team, Tallulah promoted their DIY 'BEAT bags' to collect unusual items for recycling. They collected and sorted bread tags, pens, textas, milk bottle lids and blister packs for recycling. This saved lots of small plastics from landfill. From trash to treasure, the special bag led the adventure!



Tallulah's Balnarring Environmental Action Team (BEAT) bag

Image: World Science Festival Brisbane (Queensland Museum Network)

MICHELLE USES A KAYAK TO EXPLORE AUSTRALIA'S RIVERS

MUSSEL POWER

BY INDIA SHACKLEFORD

As a freshwater mussel researcher, creeks and waterways are Michelle Hobbs' happy place. She sifts through the mud with her hands, exploring all the dark, slimy nooks and crannies to find mussels! Michelle also uses her knowledge of mussels to check the health of ecosystems, and explore links with Indigenous Knowledges from around the world.

FRESHWATER FILTERS

Mussels are related to clams, oysters and pipis. Scientists call all these animals bivalve molluscs, because their shells have 2 halves.

Freshwater mussels live on the bottoms of lakes, streams and rivers, where they act as living water cleaners. They draw in muddy water and filter it through their gills, removing any tasty treats such as algae and bacteria, and then pump out clean water. One freshwater mussel can filter more than 30 litres of water a day!

Australia is home to many species of freshwater mussels not found anywhere else in the world. They can grow up to 35 centimetres long and can live for up to 50 years. In environments with regular wet and dry seasons, a mussel's age can be estimated from counting growth rings in their shells, similar to growth rings in trees.

Image: Michelle Hobbs

FRESHWATER MUSSELS CAN GROW UP TO 35 CENTIMETRES LONG!

MYSTERIOUS MUSSELS

Michelle is a Bidjara scientist and a researcher at Griffith University. Currently, she's looking at all the jobs that mussels have in different ecosystems and mapping where each species lives. Freshwater mussels are an important part of the ecosystem, and Michelle says that there's still plenty to learn about them.

"No one's really looked in terms of how many and where they are," she explains. "Freshwater mussels have been declining all around the world, so it's really important to get an idea of where they're at now…so we can make sure they're still going to be there in the future."

MICHELLE LOOKS FOR MUSSELS

Image: World Science Festival Brisbane (Queensland Museum Network)

HITCHING A LIFT

Mussels don't spend their whole lives inside shells. In their larval stage, when they are still young, mussels live inside a fish's gills!

"The mussel can't reproduce without this stage," explains Michelle. "Once they've been attached to the fish for a few days or weeks, they metamorphose [change form], and drop off."

This adventure can take the young mussels far from where they were born.

HEALTHY MUSSELS, HEALTHY RIVER

Mussels aren't just water filters. They're also a food source for birds and freshwater fish, and a favourite meal of rakali, the native water rat. They even act as homes and habitats, providing shrimps with shelter and giving algae a surface to grow on.

Because mussels are important for many other animals and plants, they can be used as an indicator of river health. Aboriginal and Torres Strait Islander Peoples, including communities within the Murray–Darling Basin region and in Queensland, have used mussels to measure the health of rivers for many thousands of years.

"If they start disappearing, then that is really concerning," says Michelle.

SHARING KNOWLEDGE

Aboriginal people have a very long history with mussels.

"The oldest freshwater middens (collections of mussel shells) in the Murray–Darling Basin that have been dated are around 30,000 years old," says Michelle.

And mussels aren't just for eating. Their shells are used to make tools, and they can be crushed into powder and used as paint.

This year, Michelle will meet up with with Aboriginal community members in Queensland.

"I want to share with them what I know about mussels, and hear from them what they know," she explains.

She also plans to meet with First Nations Peoples in Canada and America to share Indigenous Knowledges about mussels from distant corners of the world.

MICHELLE WANTS TO LEARN ABOUT RIVERS AROUND THE WORLD

Image: Michelle Hobbs

Not in my backyard!

By Heather Gallagher

Possums are cute – but not when you're trying to sleep. Sharks are cool – but not when you're trying to swim. And bees are great for honey – but not in your backyard. So, it's up to scientists to find ways of protecting wildlife AND keeping people happy.

It's not always an easy balance!

Image: ©iStock.com/Pleio

Humans hate possums in their roofs

Preventing possum picnics

Biologist Professor Lynne Selwood began experimenting with possum deterrents after the furry critters snacked on the plants in her Melbourne garden. She studied the animals to see what plants they preferred.

"Some plants have lots of toxins in the leaves as a defence against browsing animals," she says. "The browsers have a good sense of smell, so if they don't like it, they don't go back. They have a very good memory for what plants they don't like."

Lynne made sprays from the plants the possums avoided. She then sprayed the 'yummy' plants with the extract from the less attractive plants. After much testing, she discovered that a chemical called pyrethrum (pie-REETH-rum) repelled possums. Pyrethrum is found in some chrysanthemum flowers and is a naturally occurring insecticide (a substance that kills insects).

With a little tinkering, Lynne perfected the possum repellent. It's now sold at hardware shops around Australia!

Image: ©iStock.com/Stanislav Ostranitsa

Possums hate chrysanthemums

Spotting sharks

While many people are terrified of shark attacks, statistics show you're more likely to die from a lightning strike. Even so, Australian shark attacks have climbed by 44% in the past 10 years.

The New South Wales government has responded with one of the largest shark programs in the world. The SMART (Shark Management Alert in Real Time) drumline has an anchor, 2 buoys and a satellite tracking unit attached to a baited hook. It targets white, bull and tiger sharks.

When a shark takes the bait, the tracking unit sends a satellite signal back to shore. In minutes, a team of experts head out, arriving within half an hour. They tag and release the shark one kilometre offshore.

Agriculture minister Dugald Saunders says sharks are part of what makes NSW's marine life so beautiful.

"We need to make sure we have state-of-the-art technology in place to allow them and beachgoers to coexist," he says.

Once a shark is tagged, it's much easier to track. There are 37 listening stations searching for shark tags, spread all along the NSW coast. If a tagged shark swims close to shore, an alarm goes off. Authorities can then close nearby beaches to keep everyone safe.

You don't want to spot a shark while swimming!

Image: ©iStock.com/cdascher

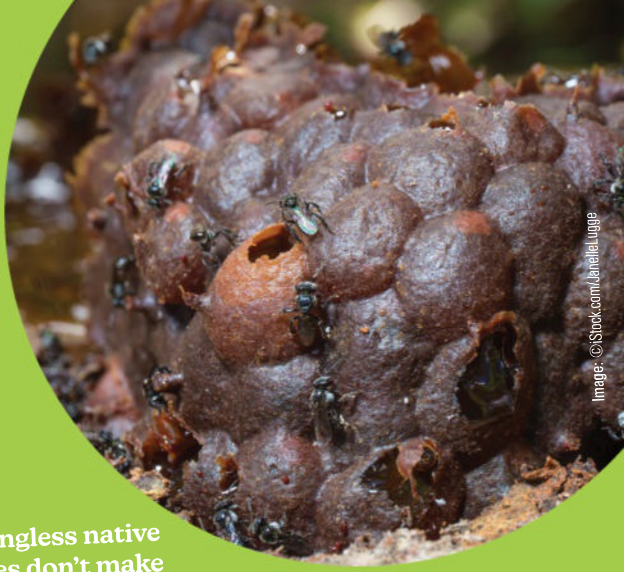


Image: ©iStock.com/JanelleLugge

Stingless native bees don't make honeycomb like honeybees do

Banishing bees

Australia is home to 11 species of native hive bees. Although these bees cannot sting, many people still avoid these excellent pollinators. Humans especially don't like it when the tiny insects set up home in the water meter or next to the front door.

Former CSIRO scientist Tim Heard designed a hive box for transporting unwanted bees. The egg sacs and honey pots are carefully cut away and put in the box, hopefully along with the queen. If the new hive box is left near the old one, the bees will gradually move over. To make the process faster, some beekeepers use a type of vacuum to collect bees directly.

Since Tim made his first hive boxes, native bee keeping has exploded as a hobby. Hundreds of people around Australia keep hives, and many of them are ready to help remove unwanted bees.

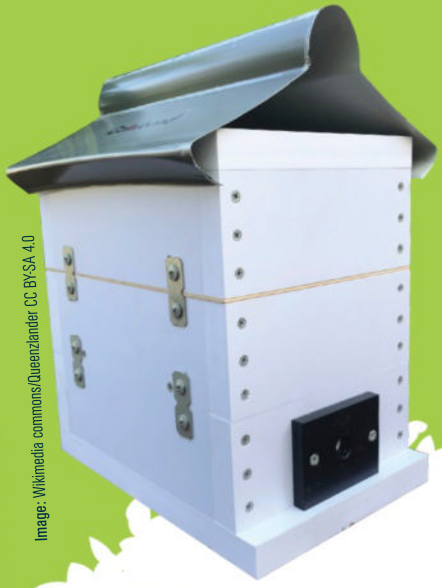


Image: Wikimedia commons/Queenzlander CC BY-SA 4.0

This hive is designed for Australian native bees

Australia has an estimated 2,000 native bee species. Most of these are loners, and don't live in hives.

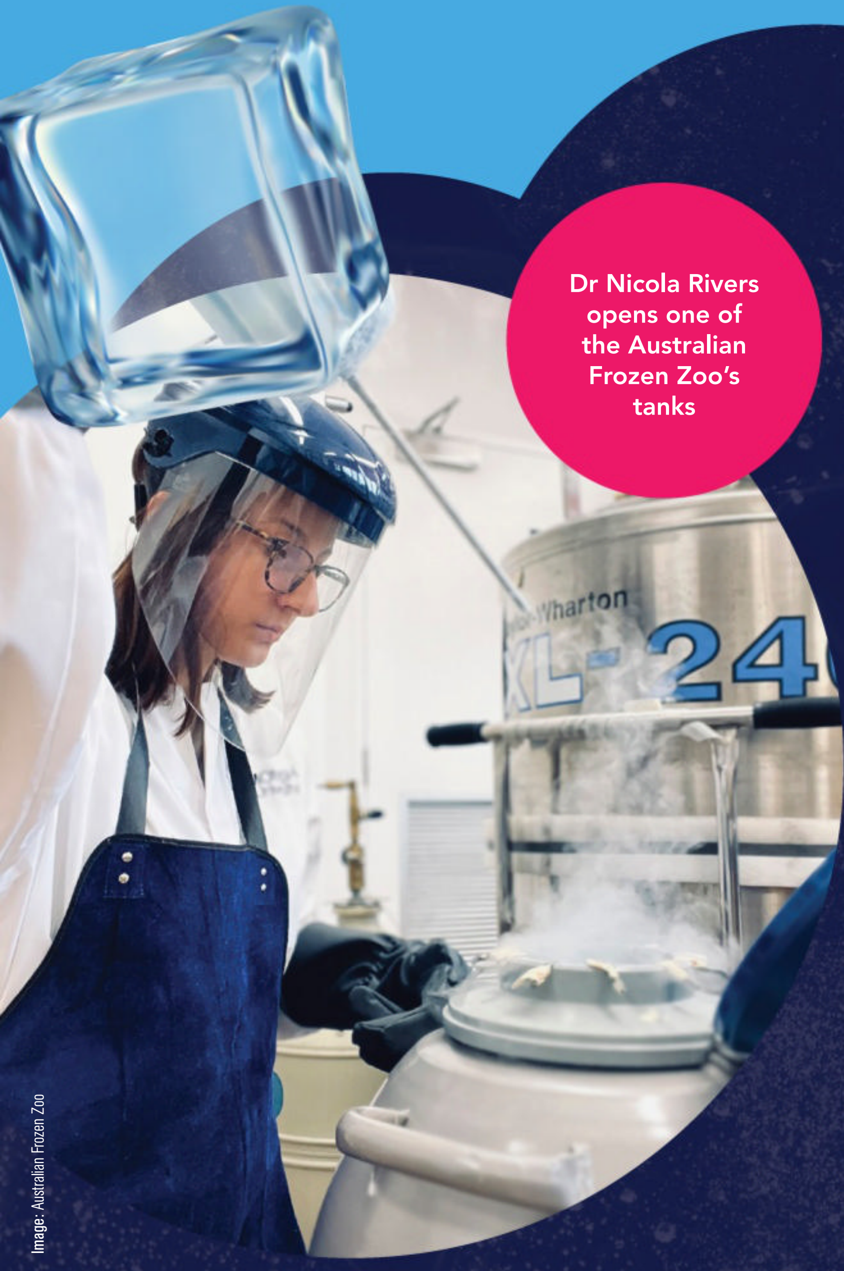
WHAT THE

FREEZE!

EXPLORING A FROZEN ZOO

BY LOUISE MOLLOY

YOU MIGHT NEED A BEANIE AND WOOLLEN SCARF TO READ THIS! WE'RE AT THE AUSTRALIAN FROZEN ZOO (AFZ) AT MONASH UNIVERSITY IN MELBOURNE. THIS ZOO HAS NO NOISY OR SNOOZING WILDLIFE. INSTEAD, IT HAS LARGE STEEL TANKS SURROUNDED BY WISPS OF WHITE MIST…



Dr Nicola Rivers opens one of the Australian Frozen Zoo's tanks

Image: Australian Frozen Zoo

INTO THE FREEZER

The mist is gas coming off the liquid nitrogen inside the AFZ's tanks. That's the freezing part. Liquid nitrogen keeps the temperature at an extremely icy −196 °C!

The AFZ is a biobank and cryobank, which means it stores frozen biological material. Animal cells such as hair, tissue, eggs or sperm that contain genetic material are collected from species in Australian zoos and wildlife parks. The genetic material is frozen and stored in the AFZ's tanks. The icy temperature hits 'pause' on cell function, preserving the cells for a long time.

A BACKUP PLAN

At the moment, samples from 81 native, rare or exotic species are stored in the tanks. About 70% of these species need conservation attention to help protect them.

But the AFZ is only a possible safeguard against extinction – not a guarantee. For starters, scientists are still working out how to reproduce species from frozen cells. And even if they succeed, the environment may have changed too much for these species to survive in the wild.

With all the challenges facing our wildlife though, at least we have this rescue strategy up our sleeves.

PROTECTING THE POOKILA

Meet one of the animals with genetic material stored at the frozen zoo – the endangered pookila, or New Holland mouse. Once found across south-east Australia, it is now extinct in 7 of the 12 locations in Victoria that it called home.

The pookila's future depends on a range of conservation strategies. In 2022, Melbourne Zoo and Moonlit Sanctuary started a breed-and-release program to boost its numbers. However, we also need to deal with feral predators, such as cats and foxes, and loss of habitat.

Scientists at the AFZ are researching how to grow new cells, including sperm and eggs, from the pookila's frozen tissue – just in case.

Hello! I'm a pookila, an endangered Australian mouse

Image: Flickr.com/Doug Beckers CC BY-SA 2.0

ON A MISSION

Dr Nicola Rivers is a reproductive biologist at the AFZ. Here's her take on it.

"I find the mission of the AFZ the coolest part about it. Day to day, the process of maintaining a biobank involves a lot of databases and admin, which can be quite dry work. But it's all worth it when we are able to safeguard Australian species."

Nicola's also researching reproductive (breeding) technologies for the endangered Murray River rainbowfish. She's always loved watching fish, and thinking about their mysterious lives.

"Fish, especially small, freshwater species, tend to be a bit neglected, so it felt right to focus my energy there," she says.

Nicola is researching tech to help Murray River rainbowfish like me

Image: Gunther Schmida / http://www.guntherschmida.com.au. (CC BY-NC)

KEEPING SPECIES SNUG AND SAFE

Around Australia, biologists are looking at ways to use frozen zoos and captive breeding programs to help bring species back from the brink of extinction.

In fact, the AFZ is one of 22 frozen zoos worldwide taking part in the Frozen Ark project. Together, these zoos hold cells from more than 5,000 species snug, in an icy way!

COLD WORDS

Cryo (CRY-oh) means icy cold. For scientists, cryo temperatures are usually colder than −153 °C!

A second chance for baby bats

By Amanda Freeman

Image: ©iStock.com/Connie Pinson

Meet Zizi. She was the smallest spectacled flying fox, or fruit bat, cared for at the Tolga Bat Hospital last summer.

Rescue

Staff from the Tolga Bat Hospital, in far north Queensland, rescue hundreds of spectacled flying fox babies every year. Like most of them, Zizi came into care after her Mum was bitten by a paralysis tick.

“It’s a native tick that most wildlife is immune to,” says the bat hospital’s director, Jenny Mclean. This means that most animals won’t get sick if bitten. But spectacled flying foxes can get very sick from tick bites.

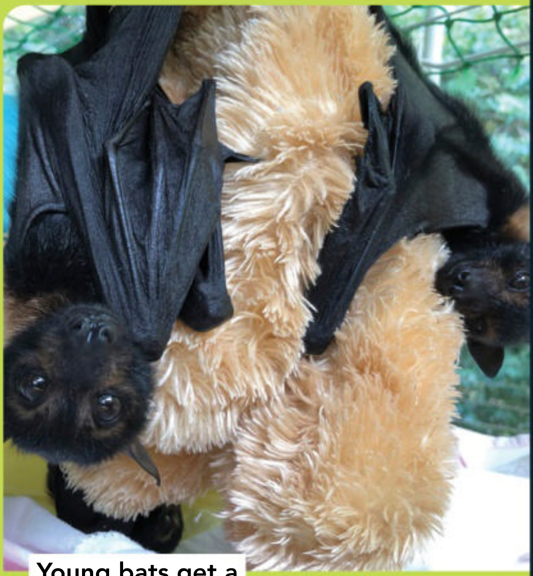
When this happens to bat mothers, they can’t care for their pups. Jenny and her volunteers care for the motherless baby bats until they’re big enough to survive in the wild.

Baby bats love sucking on dummies, just like human babies!

Image: Tolga Bat Hospital

Spectacled flying fox facts

- They are endangered
- They live in Queensland’s wet tropics, and on the island of New Guinea
- Their biggest threats are heatwaves and people destroying their habitat
- They pollinate flowers and spread seeds throughout the forest



Young bats get a teddy bear to hang on to

Image: Tolga Bat Hospital

The Nursery

When they first arrive at the hospital, baby bats are weighed and measured. Instead of their height, young bats have their forearm measured and recorded on their growth chart.

"That tells us if, in the wild, Mum would still be flying around with them," Jenny explains.

Spectacled flying fox mothers carry their babies until they're about one month old. After that, the babies are left with other young bats when Mum flies out to feed.

"Zizi should have still been with her mother," says Jenny.

In place of Mum, newborn flying foxes have a heat pad for warmth and a stuffed toy to hang on to. Until the babies are about 4 weeks old, they're fed flying fox baby formula from a bottle. Then they can feed themselves from dripper bottles. Carers wrap the baby bats snugly for their feeds.

"The wraps keep their wings contained," says Jenny. "When they've been fed and toileted, they go back to their box or are carried around clinging to hospital volunteers."

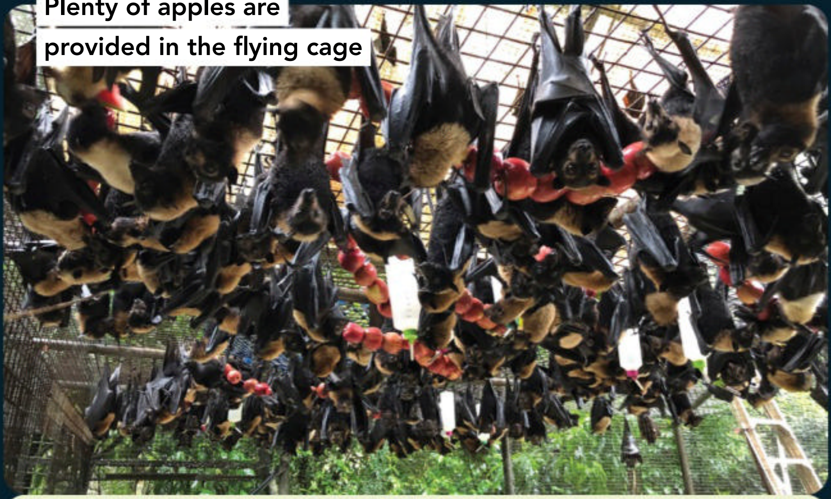
Moving outside

The youngsters graduate from the nursery to a cage outside when they weigh about 200 grams – about the same as a cup of sugar.

"That's when their mother would leave them at night," says Jenny. "They start doing a lot of flapping to build up their flight muscles."

In the wild, spectacled flying foxes drink their Mum's milk until they're 5 or 6 months old. They only eat fruit once they can fly and get it for themselves. At the hospital, the young bats get fruit as well as milk when they move outdoors. At first, they get soft fruit, then increasing amounts of hard fruits, such as apples.

"They just go for it," says Jenny. "There's no holding back once they get fruit."



Plenty of apples are provided in the flying cage

Image: Tolga Bat Hospital

Taking flight

When they reach about 300 grams, the growing bats need more space.

"They're starting to do short flights," Jenny explains. "So, we move them into the flight cage."

Here, they get a larger proportion of hard fruit.

"They still get milk twice a day," says Jenny. "But now they get a lot of their milk in banana smoothies."

Yum!

Bats hang out inside and outside the release cage

Image: Tolga Bat Hospital

Release

When the young bats weigh about 450 grams and can fly, they're ready for release. Bat hospital carers move them to a cage near a spectacled flying fox camp. After a few days, they open the cage door, and the young bats are free to come and go with the wild bats.

This gives orphaned spectacled flying foxes such as Zizi a second chance at life.

A QUOLL-ITY REINTRODUCTION

BY DR CATHERINE ROSS AND BELINDA WILSON

BRINGING A SPECIES BACK FROM EXTINCTION TAKES A LOT OF TRIAL AND ERROR, BUT IT HELPS TO GET THE TACTICS RIGHT!

Image: ©iStock.com/FiledIMAGE

MEET THE EASTERN QUOLL

This cute critter is an eastern quoll. Although quolls look a bit like spotty cats, they are actually marsupials, just like kangaroos. Eastern quolls were once common throughout southeastern Australia, but humans caused them to disappear from the mainland in the 1960s. They became 'locally extinct', which means none were left in the wild on the Australian mainland. Thankfully, eastern quolls survived in Tasmania, so they weren't fully extinct.

Image: Don Fletcher

Mulligans Flat has a fence that keeps out foxes, cats, and rabbits

Image: Adrian Manning

MAKING A PLAN

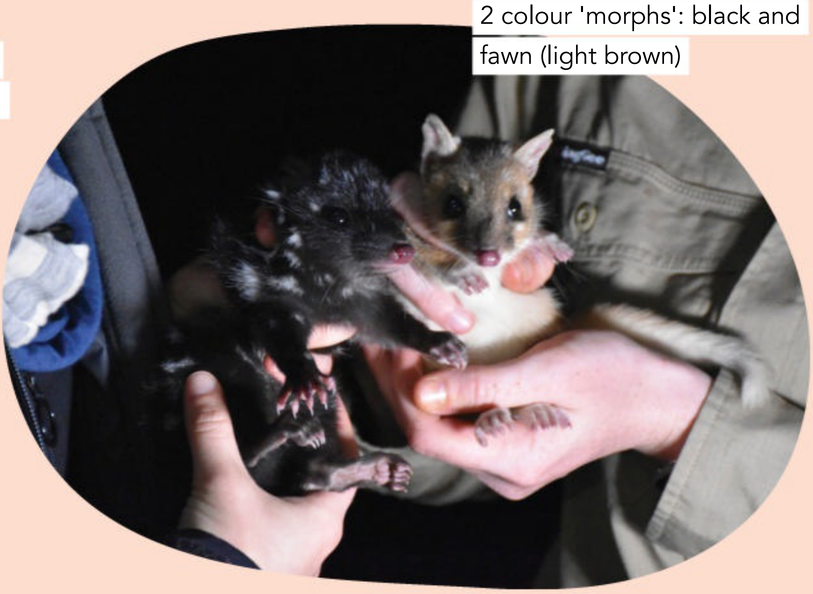
Researchers at The Australian National University are trying to bring eastern quolls back to the mainland. Reintroducing a species is not as simple as moving animals. It can be a bit like playing chess – you need to use tactics and strategies to increase the chance that the animals will survive.

The researchers chose a release site near Canberra, called Mulligans Flat Woodland Sanctuary. This nature reserve is a grassy woodland, which means it has some trees and some grass. It's the perfect habitat for quolls. Even better, Mulligans Flat is surrounded by a predator-proof fence to keep cats and foxes out.

Belinda Wilson releases a quoll

Image: Christine Fernance

EASTERN QUOLLS ARE CALLED 'MURUNGUNY' IN THE LOCAL NGUNNAWAL LANGUAGE



Eastern quolls come in 2 colour 'morphs': black and fawn (light brown)

Image: Dr Ann Jones, ABC Science

A TRICKY START

In 2016, researchers released eastern quolls in Mulligans Flat for the first time. They wanted the quolls to be as different as possible, so they picked 8 quolls from the wild in Tasmania, and 8 that had been bred in captivity. The quolls wore tracking collars to let the scientists know where they went and make sure they were safe.

Unfortunately, within days of release, many of the quolls climbed over the fence and out of Mulligans Flat! Some were recaptured, but sadly, several were killed by foxes. But it wasn't all bad news. Some quolls stayed inside the fence and survived. After a few months, some even had babies!

A BRIGHTER FUTURE

The next year, the researchers looked back at their successes and failures. They realised that most of the escapees were male quolls. That made sense because males are more territorial than females.

The team decided to release only female quolls, but that wasn't the only clever idea they tried. The new batch of quolls were only released after the breeding season, so that they would be carrying young at the time of release. Instead of trying to escape, these mothers quickly found dens and settled down to raise their young!

By taking chances and adapting their tactics, the researchers at Mulligans Flat improved eastern quoll survival from 30 per cent to almost 90 per cent in just 3 years! Now there is a thriving population of eastern quolls in Canberra. And using all the scientists have learned, the next reintroduction will be even easier!

Quolls often make their dens in hollow logs

Image: Adam McGrath

'QUOLL-ITY' FACTS

1. Quolls are nocturnal and spend most of the daytime in their dens.
2. There are 6 species of quoll, and they are only found in Australia and New Guinea.
3. Quolls give birth to up to 30 tiny hairless babies, which then have to crawl into their mother's pouch. Because there are only 6 teats, only 6 babies can be raised to adulthood!
4. Quolls are predators, eating small animals such as mice, lizards and insects.

Mice and rats are the most famous rodents on Earth, but not all rodents are pests. Many rodents, such as the hazel dormouse, play important roles in ecosystems. These cuties eat fruit and seeds. This helps to spread the seeds and grow plants in new places!

Thousands of species of rodents are found around the world. As well as mice and rats, rodents include beavers, chipmunks, hamsters, lemmings, porcupines, squirrels and more!

Image: ©iStock.com/slowmotiongli

DoubleHelix

CSIRO

www.doublehelix.csiro.au

GAMER'S
REVIEW

BY BENNY FAIR

Railroad Ink: Deep Blue Edition

BY HJALMAR HACH & LORENZO SILVA

If you want a game that combines strategy and creativity, then *Railroad Ink* is the game for you.

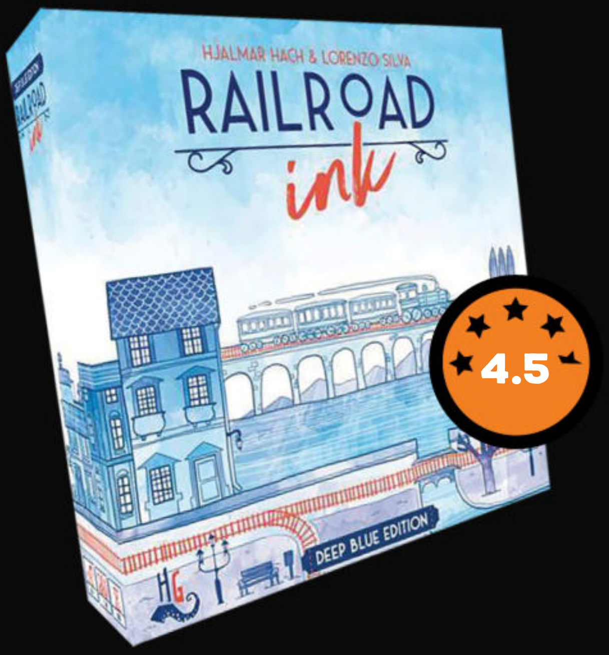
Each round of the game consists of rolling the dice that display highway and railroad elements, and then drawing them on the game boards, with the aim of building the longest railroad and highway combinations.

I particularly enjoyed the *Deep Blue* expansion edition of the game, which adds optional lake and river dice to use, unlike the basic railroad and highway dice, which you must use. The addition of lakes and rivers to your board adds a whole new level of complexity to the game.

The game is well designed, and it's so easy to understand, even parents can do it! It combines both skill and chance. You could have a strategy that gets used to its fullest potential, while other players may find their plans foiled by an unlucky roll. In my first game I got really lucky and got a fantastic score.

The scoring system means that while you can play it as a competition between you and others, you can also play against yourself for a high score. You can improve your strategic skills until, when you finally play competitively again, you're the best player at the table.

The game was great fun for the whole family, and I highly recommend it for people of ages 10+.



READER'S
REVIEW

BY ANYA BATH-SAMARAKOON

101 Ways to be an Eco Hero

BY KAIT EATON

Are you looking to learn about the environment? Do you want to reduce your carbon footprint or become a climate change activist? If so, this book is for you.

101 Ways to be an Eco Hero is a spectacular book, with tips from personal environmental hero 'Rhino Ray'! There are easy-to-read sections, simple sentences and bright, coloured illustrations that make it quick to understand for children of all ages.

This book is split into 3 sections, with so many inspirational ideas to help the environment:

1. Small, simple, yet impactful actions to make you a true eco hero – all in your own home!
2. Fun and interesting activities that you and your family can do together outside your home, e.g. a day of travelling on public transportation.
3. Becoming an activist – bigger projects that benefit your entire community, such as appealing to companies such as TerraCycle to set up recycling bins for hard-to-recycle items (e.g. ink cartridges).

I only found 2 negatives:

1. There is no glossary, even though there are some difficult words, which can make it confusing for younger readers.
2. I found out that "chewing gum is made of plastic", so it has put me off gum forever!

Overall, I would rate this book 4 out of 5 and like me, I hope it inspires you to become an eco hero!

lonely planet Kids
101
WAYS TO BE AN
ECO-HERO
WRITTEN BY KAIT EATON
HELP SAVE THE WORLD, ONE SMALL STEP AT A TIME!
★★★★
4

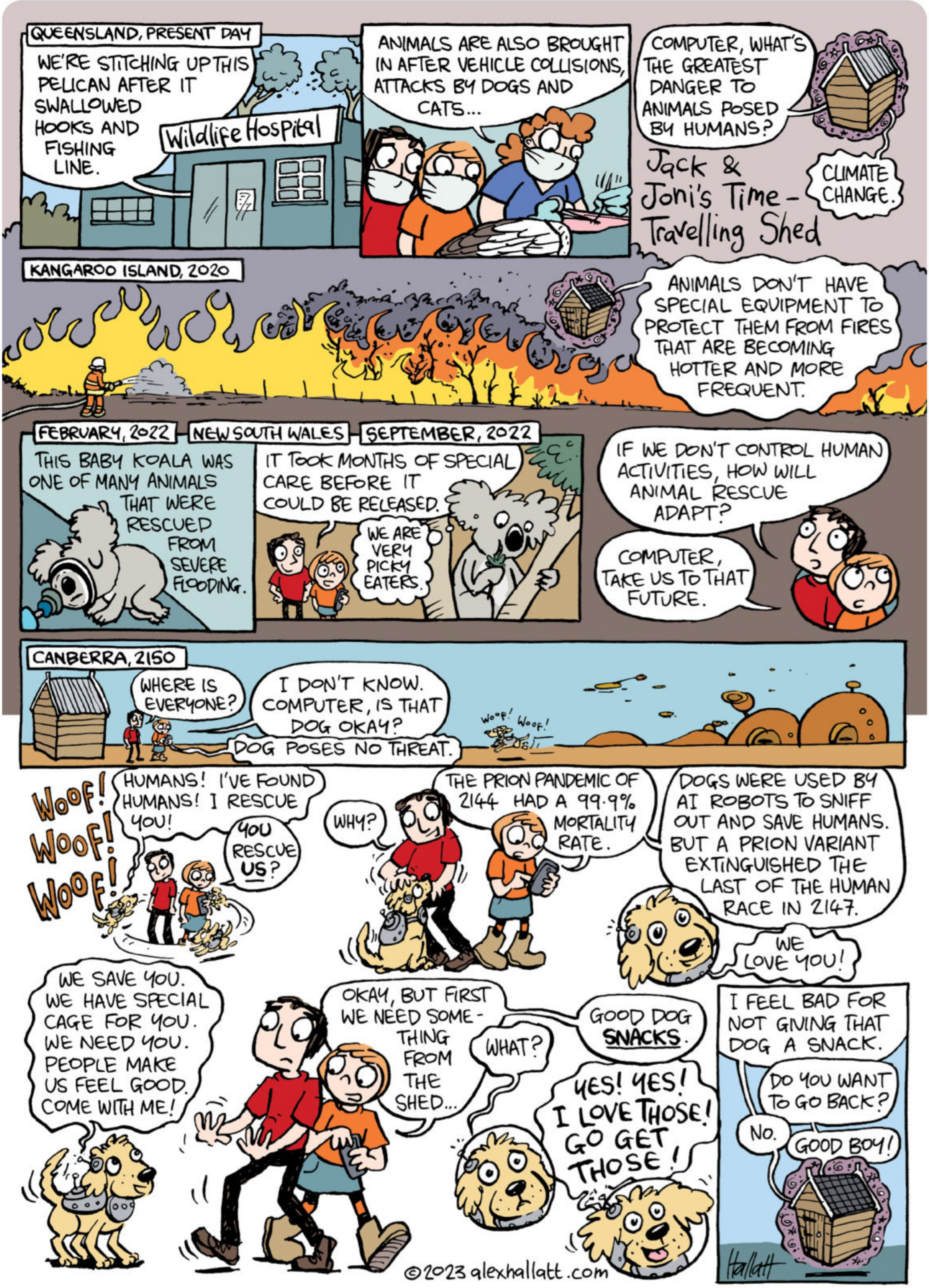

Jack & Joni's Time-Travelling Shed
QUEENSLAND, PRESENT DAY
WE'RE STITCHING UP THIS PELICAN AFTER IT SWALLOWED HOOKS AND FISHING LINE.
Wildlife Hospital
ANIMALS ARE ALSO BROUGHT IN AFTER VEHICLE COLLISIONS, ATTACKS BY DOGS AND CATS...
COMPUTER, WHAT'S THE GREATEST DANGER TO ANIMALS POSED BY HUMANS?
CLIMATE CHANGE.
KANGAROO ISLAND, 2020
ANIMALS DON'T HAVE SPECIAL EQUIPMENT TO PROTECT THEM FROM FIRES THAT ARE BECOMING HOTTER AND MORE FREQUENT.
FEBRUARY, 2022
NEW SOUTH WALES
SEPTEMBER, 2022
THIS BABY KOALA WAS ONE OF MANY ANIMALS THAT WERE RESCUED FROM SEVERE FLOODING.
IT TOOK MONTHS OF SPECIAL CARE BEFORE IT COULD BE RELEASED.
WE ARE VERY PICKY EATERS.
IF WE DON'T CONTROL HUMAN ACTIVITIES, HOW WILL ANIMAL RESCUE ADAPT?
COMPUTER, TAKE US TO THAT FUTURE.
CANBERRA, 2150
WHERE IS EVERYONE?
I DON'T KNOW. COMPUTER, IS THAT DOG OKAY?
DOG POSES NO THREAT.
WOOF! WOOF!
WOOF! WOOF! WOOF!
HUMANS! I'VE FOUND HUMANS! I RESCUE YOU!
YOU RESCUE US?
WHY?
THE PRION PANDEMIC OF 2144 HAD A 99.9% MORTALITY RATE.
DOGS WERE USED BY AI ROBOTS TO SNIFF OUT AND SAVE HUMANS. BUT A PRION VARIANT EXTINGUISHED THE LAST OF THE HUMAN RACE IN 2147.
WE LOVE YOU!
WE SAVE YOU. WE HAVE SPECIAL CAGE FOR YOU. WE NEED YOU. PEOPLE MAKE US FEEL GOOD. COME WITH ME!
OKAY, BUT FIRST WE NEED SOMETHING FROM THE SHED...
WHAT?
GOOD DOG SNACKS.
YES! YES! I LOVE THOSE! GO GET THOSE!
I FEEL BAD FOR NOT GIVING THAT DOG A SNACK.
DO YOU WANT TO GO BACK?
NO.
GOOD BOY!
Hallatt
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Image: Alex Hallatt

AVAXHOME -

the biggest Internet portal, providing you various content: brand new books, trending movies, fresh magazines, hot games, recent software, latest music releases.

Unlimited satisfaction one low price
Cheap constant access to piping hot media
Protect your downloadings from Big brother
Safer, than torrent-trackers

18 years of seamless operation and our users' satisfaction

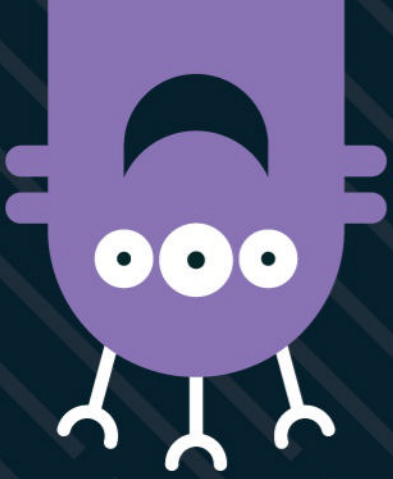
All languages
Brand new content
One site

AVXLIVE.ICU

AvaxHome - Your End Place

We have everything for all of your needs. Just open https://avxlive.icu

NEAR NEIGHBOURS



GREETINGS, COSMIC COMPANIONS. GAIL LEXY HERE, INVITING YOU TO MEET THE NEIGHBOURS!

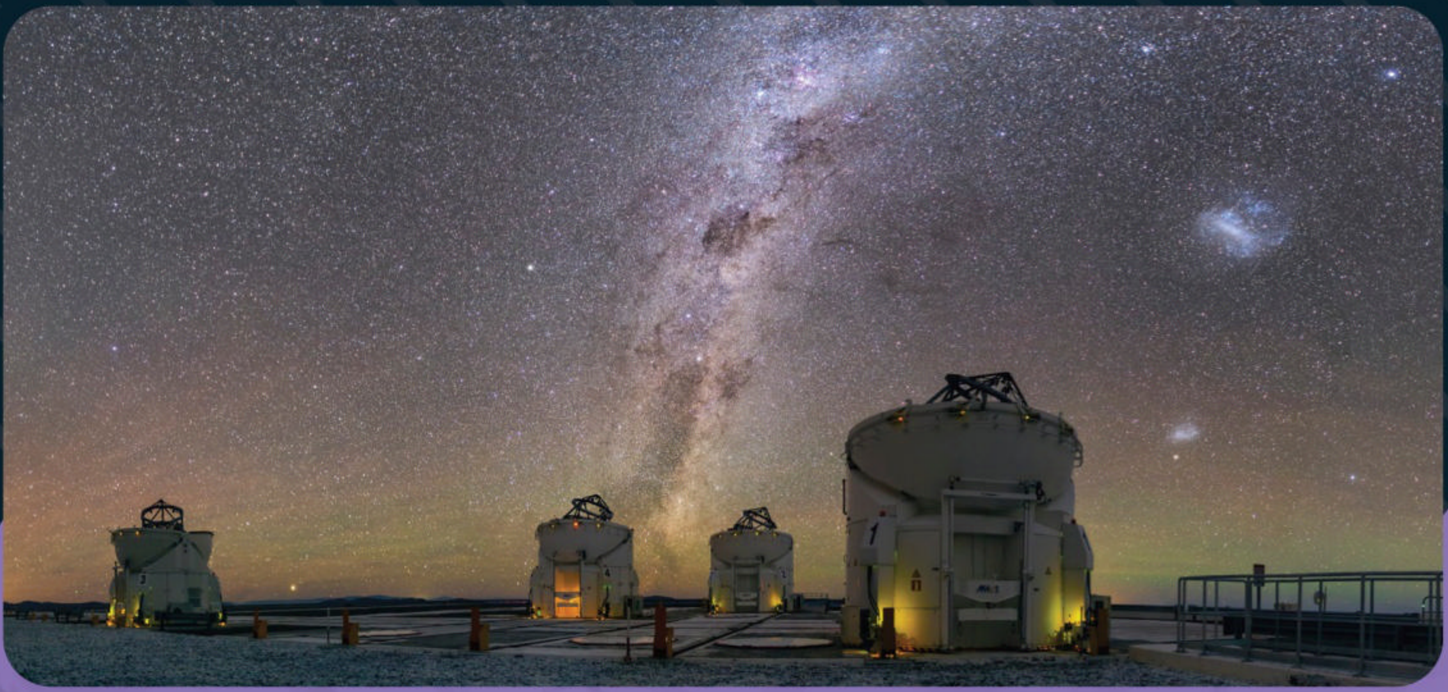


Image: ESO/Juan Carlos Muñoz Mateos

The Magellanic Clouds (right) are next to the main band of the Milky Way (centre)

When you look up to the stars, nearly everything you can see is in the Milky Way galaxy. But you can also sneak a peek at 2 near neighbours – without needing a telescope. The Small and Large Magellanic Clouds are small galaxies that orbit our Milky Way. They can be seen from Earth's southern hemisphere.

To spot these galaxies, get away from city lights on a clear night with little moonlight. Look south.

"Those little smudges of stars to the side of the Milky Way are the Small and Large Magellanic Clouds," explains galaxy guru, Naomi McClure-Griffiths of the Australian National University.

"They tend to look like clouds, which is why they got named that way. You might think there's a bit of cloud in an otherwise clear sky, but in fact they're nearby galaxies."

These cloudy-looking companion galaxies are important to many communities living under southern skies. To the Gamilaroi of northern New South Wales, they are 2 burraalga, or brolga birds. They take their western name from 16th century Portuguese navigator, Ferdinand Magellan, who saw the clouds during his voyage in the southern seas.

The Milky Way has about 50 smaller galaxies around it. The Large Magellanic Cloud is the largest of these, and the nearest one you can see with the unaided eye. It's 179,000 light years away, while the Small Magellanic Cloud is 210,000 light years away. That's very close in astronomy terms!

"The Milky Way is a much, much bigger galaxy that sort of bosses these 2 little ones around," says Naomi. "Lots of their material is being pulled away by the gravity of the Milky Way, which is so strong in comparison. They're flinging their hydrogen gas all over the place."

Eventually, the Magellanic Clouds and the Milky Way will merge.

"The Milky Way is a big galaxy for a reason," reveals Naomi. "It consumes other galaxies."

Although you can see the fuzzy shape of the Magellanic Clouds without any equipment, binoculars are handy for viewing their clusters of stars and clouds of dust and gas. So grab a pair, head outside, and sneak a peek at the neighbours. They're just over your galactic back fence!

DESIGNER PETS

Cats and dogs make great pets. But can we make them better?

Image: ©iStock.com/Ekaterina Gorokhova

If you could, would you clone your pet?

NOW

It's really sad when your pet dies. But would it make you feel better to have a cloned pet to replace it?

Several companies are offering to clone pets. They take a sample of DNA, and put it into a zygote (ZY-goat) – the cell that eventually grows into an animal. It's a very expensive process, and it doesn't always work the first time.

Although the old and new pets have the same DNA, they aren't exactly the same. They won't be raised in the same way, and they'll have different memories, so their personalities will be different too. But that shouldn't be surprising. Identical twins are clones of each other, and they are definitely different people!

SOON

The past year or so has seen an explosion in artificial intelligence (AI) technology. So what does AI have in store for our pets?

Several companies are creating AIs to translate between animals and pets. Zoolingua is focusing on dogs, aiming to turn barks and body language into English words. No more guessing whether your dog wants to go to the toilet or is just scared of the garbage truck!

Robot pets are another side to the AI pet revolution. Better AI will make robot pets smarter, cuter and more lovable than ever!

EVENTUALLY

We humans designed better pets by breeding the best ones together. We're still changing dogs, cats and every other species we keep as pets.

With genetic engineering, it's now much easier to change our pets' DNA. Scientists added a gene to aquarium fish to make glow-in-the-dark GloFish. And a company called Felix Pets removed a gene from cats that gave people allergies.

But with cheaper genetic engineering, big things could be coming. A lot of dog breeds have genetic diseases – we could edit these out and make dogs healthier. Or we could identify genes for trainability or friendliness. With research, we could make man's best friend even better!

JUST IMAGINE

"Humans turned wolves into dogs," explained Jack. "But all that old DNA is still in there. All I did was turn it back on."

Elna was trying to be brave. The wolves were playing like dogs, but their teeth looked awfully sharp.

"Are you sure they won't bite?" she asked. "Not even by accident?"

Jack smiled confidently.

"Don't worry! We added in a bunch of genes from Labradors and beagles. They might look scary, but they're the nicest animals you'll ever play with. Unlike that thing…" Jack gestured at something moving fast in the corner of the lab.

"What is that?" Elna asked as the wolves growled softly.

The thing lingered, hiding behind benches and boxes. Elna couldn't see well, but it was almost chicken shaped, with black-and-white feathers.

"My greatest mistake." Jack was sad, but proud. "Birds descended from dinosaurs, so I thought I'd see what I could find hidden in their DNA. Meet the veloci-magpie."

The veloci-magpie approached, planning its attack.

CAPTURE YOUR ANSWER

Image: ©iStock.com/cienpies

SOMETIMES THE BEST WAY TO FIGURE SOMETHING OUT IS TO GRAB A SCRAP OF PAPER AND DO A QUICK CALCULATION. SCIENTISTS CALL THESE 'BACK OF THE ENVELOPE' CALCULATIONS. GET YOUR ENVELOPE READY!

QUESTION

HOW DO WE FIND OUT HOW MANY KANGAROOS ARE ON KANGAROO ISLAND?

ANSWER

We could just try to count them. But kangaroos have a pesky habit of…jumping. If you've ever tried to count everyone in your school playground, you'll know how hard it can be to count moving animals!

There is another problem with just counting all the kangaroos one by one. There are a lot of them! Counting every individual is too much work.

So what do we do? Ecologists use lots of clever tricks to work out population sizes. One of these is called mark–recapture, or capture–recapture. Here is the basic method:

1. Trap a random group of animals without harming them.
2. Count the trapped animals, mark them (for instance, with an ankle tag), and release them.
3. Trap another random group of animals, and count how many you have altogether, plus how many have a tag.

Amazingly, this method gives you enough information to work out the total number of animals. This is because the ratio (or percentage) of tagged animals in the second capture should be about the same as the ratio (or percentage) of tagged animals in the whole population:

$$\frac{\textit{tagged}}{\textit{all}}\ \textit{in the traps} = \frac{\textit{tagged}}{\textit{all}}\ \textit{on the island}$$

We can rearrange this equation to get the total population:

$$\textit{all on the island} = \textit{tagged on the island} \times \frac{\textit{all}}{\textit{tagged}}\ \textit{in traps}$$

For example, if we trap and mark 500 kangaroos, and then another day trap 550 kangaroos and find that 4 of them are tagged, we would have:

$$\textit{all on the island} = 500 \times \frac{550}{4}$$

$$\approx 69{,}000$$

With just 3 numbers, we've got a rough guess of the total population. But this example shows one problem. If you don't mark enough of the population, you might not get many marked animals in your recapture. Then, a small change in the number of marked recaptured animals could make a big difference to your final number. If we recaptured 3 or 5 kangaroos (rather than 4), then our total approximate population would be 92,000 or 55,000 – that's a large range!

To make this method work better, we also need the population not to be changing in number. This means the 2 sets of trapping need to happen within a short time, and we need an 'island' where animals are contained. An 'island' could be a real island, or it could be a lake, fenced reserve, isolated forest or even a single tree.

What about counting the number of woodlice under a dead log? They might not jump about as much as kangaroos!

WHAT'S YOUR QUESTION?

Got a weird and wonderful question about science, technology, engineering or maths?
If you don't know who to ask, let us help you out! We'll find answers to the best questions and publish them here.
EMAIL helix.editor@csiro.au TWEET @CSIROhelix #DHMicroscope

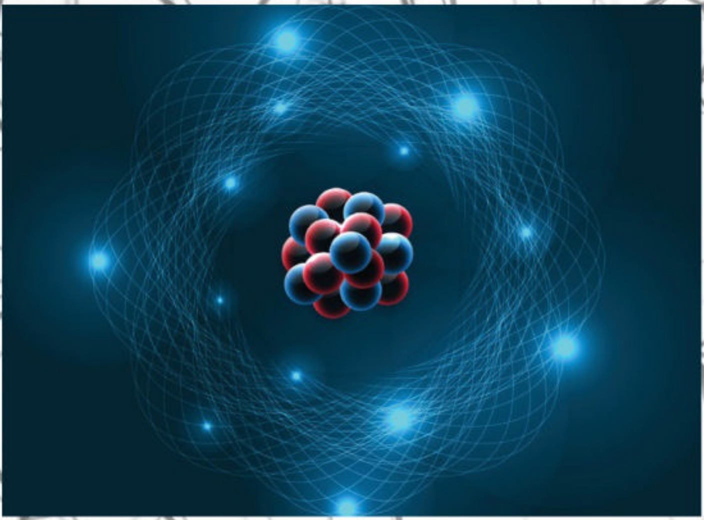
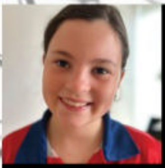


Image: ©iStock.com/Adisonpk

Atoms are made up of a nucleus of protons and neutrons, orbited by electrons



ALICE ASKS

IF EVERYTHING IS MADE FROM ATOMS, WHAT ARE ATOMS MADE UP OF?

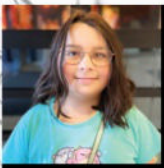
Atoms are made of smaller particles called protons, neutrons and electrons. Protons and neutrons cling together, making a dense core called a nucleus. The electrons loosely occupy a space nearby.

Electrons are described as fundamental particles. No amount of energy can smash one apart into anything smaller.

But protons and neutrons can be destroyed in a flash of energy that produces showers of different kinds of fundamental particles. Some, called quarks and gluons, are what make up protons and neutrons. A particle of light, called a photon, is also a fundamental particle.

So what are fundamental particles made of? This is where it gets tricky to imagine. Physicists use the mathematics of waves to describe how they behave, but some researchers think they are more like buzzing 'strings' of something.

Whatever it is, it's bound to be weird and hard for us to picture.



CASSIE ASKS

WHEN DID PETS FIRST APPEAR?

For thousands of years, humans have taken care of animals to suit all kinds of needs. From foods like eggs, meat and milk, to wool and leather, animals provide for us. We even use them for transport! Pets are animals we keep near us for companionship, and the 2 most popular are dogs and cats.

Today's pet cats are descended from small wildcats, while dogs came from wolves. These species have been around for about 300,000 years, but it took humans a while to call them friends.

Let's look at dogs first. Peering into their DNA gives us a lot of clues. Researchers now think that wolf-like animals and humans became friends on more than one occasion. In some cases, this was many tens of thousands of years ago – long before the first towns and cities were built!

Cats, on the other hand, most likely started hanging around people far more recently: around 10,000 years ago. It's possible that as humans began to store grains, such as wheat and rice, mice moved in for an easy food source. Then cats turned up to catch them!

Over 3,000 years ago, prince Thutmose buried his cat in this sarcophagus

Image: Flickr.com/Larazoni CC-BY

FICTION BY TOM DULLEMOND

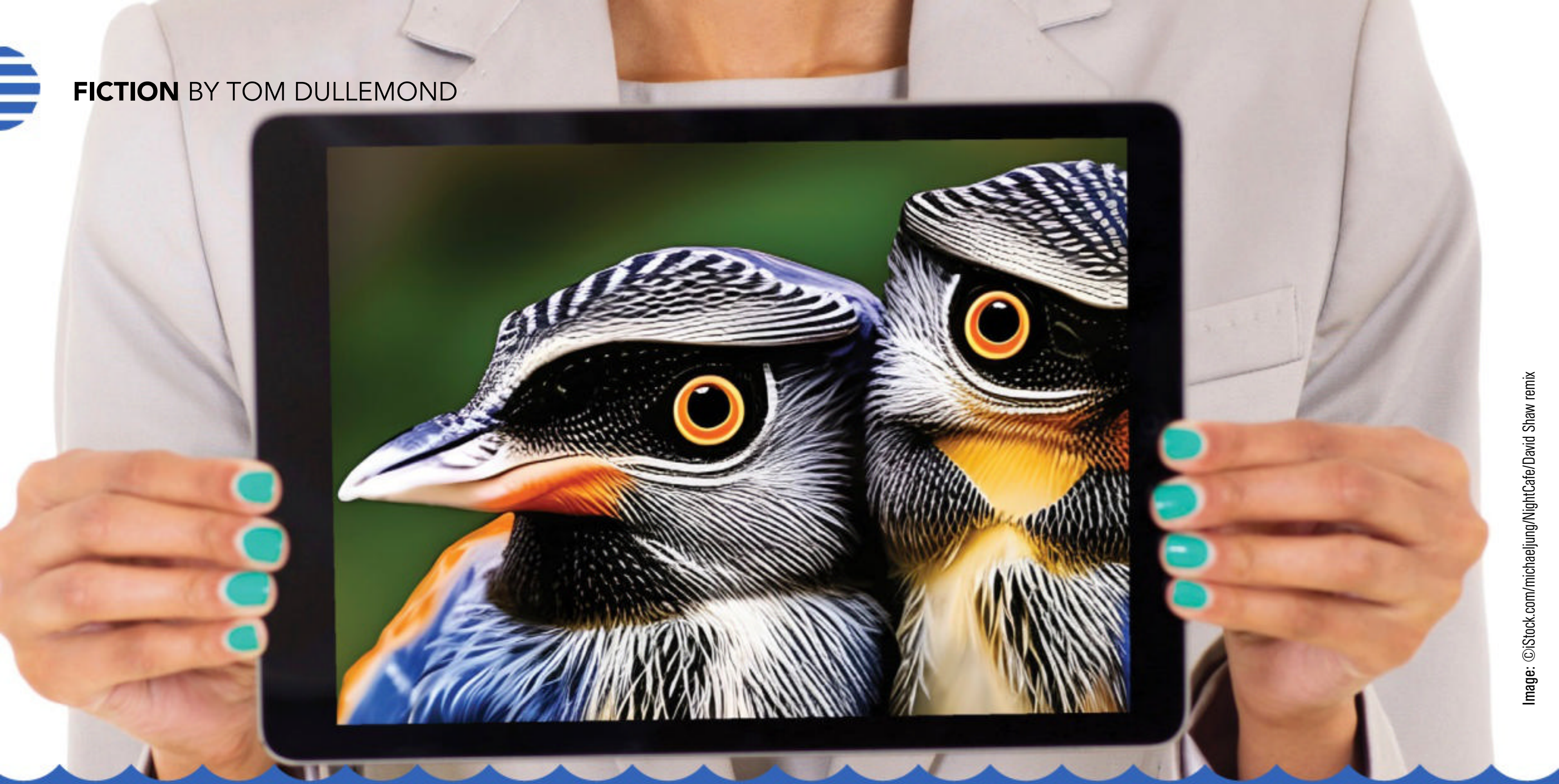


Image: ©iStock.com/michaeljung/NightCafe/David Shaw remix

BUDGET CUTS

The air in the busy food court smelled like fresh grass. Jango tried to breathe in as much as he could to calm himself.

His assistant Meredith sighed as they sat down.

"At least they gave us funding for more hand sanitiser," she said. "Pity about protecting the snorblad larvae."

Jango scrolled through the menu options.

"Dr Shiva was very clear we need conservation funding. When we tell her she'll be …"

"She'll be what?" said a third voice.

They looked up as Dr Emily Shiva hopped into the booth with them. Jango and Meredith were shocked: they had never really seen Dr Shiva outside of an environmental hazard suit before. But here she was wearing an expensive business suit, her hair freshly washed and…makeup?

"…Upset?" Jango finished.

"Nonsense! I love budget time. I get to stretch my legs," Dr Shiva replied.

She smiled, showing a line of shiny white teeth.

"I'm sorry," Jango said. "I explained how critical the larvae are to your research, but they didn't care. Maybe someone told them about the smell, or they noticed all the stains on the equipment we borrowed."

"Ah, you mentioned snorblad goop," the doctor replied. "Fun!"

Meredith couldn't suppress a shiver of nausea.

"Hardly," she managed.

"Well, I'll catch up after the budget, see you soon!", said Dr Shiva as she got up to head towards the presentation room.

"Let's get our lunch orders in," Jango said. "She'll be in a mood afterwards. Imagine the horrible stories she'll share to cheer up."

* * *

Dr Shiva returned 15 minutes later, eyes wide with excitement.

"That's solved for another year," she said.

Her hair and makeup were still immaculate.

"You're chirpy," Jango replied. "How many people left with stomach complaints after your slideshow?"

She ignored him.

"Oh, I never talk about *fun* things at budget time. What would they think if I showed them how amazing a snorblad larva is after the first liquefaction?"

She laughed heartily while Meredith quietly spat her food into a napkin.

Jango frowned.

"You didn't ask for snorblad funding? Wasn't it critical?"

"The larvae are key to keeping the ecosystem together," Dr Shiva replied. "But no."

She slipped her tablet out from under her arm and placed it on the table, showing two beautiful, blue-and-orange bird-like creatures. They were shockingly cute, with big eyes and shiny beaks. She wrinkled her nose.

"Look at these posers. Cute, sure. And *boring!*"

Jango and Meredith glanced at each other, confused.

"I showed them these *beautiful* babies...and now we have funding to preserve them in all their shining glory."

"But?" asked Jango.

"It turns out a huge part of saving these show-offs is preserving their main food source: snorblad larvae," Dr Shiva shrugged. "Regular people will fund you when it's for something pretty, like these bird-things. They just don't appreciate liquifying larvae...speaking of which!"

Meredith gulped some water. Jango gritted his teeth.

Dr Shiva brightened.

"I have a slideshow here of the latest hatchlings, and boy, are they *gloopy!*"

LET'S LOOK FOR ECHIDNA POO!

BY JACINTA BOWLER

HAVE YOU EVER SEEN ANIMAL POO WHILE OUT ON A WALK OR TRAIL?

EchidnaCSI is a fun citizen-science project that asks people to take photos and collect poo (scientifically known as scat) from echidnas.

The photos help researchers know where echidnas are, and their poo can be used for DNA analysis. It's a real stinky win!

Safety: You will need to be outside for this activity. Remember to be sun safe and ask an adult to supervise you. Wear gloves when touching animal poo and do not approach any wildlife. Ask a parent's permission to use the iNaturalist app.

HOW TO FIND ECHIDNA POO

You're more likely to see an echidna poo than an echidna – but how can you tell if a scat is from an echidna?

"They look like little tubes of soil," says Dr Tahlia Perry, the creator of EchidnaCSI. "They're about the width of a 10-cent coin or a 20-cent coin. And they can be about 10 to 15 centimetres long – so they're pretty big."

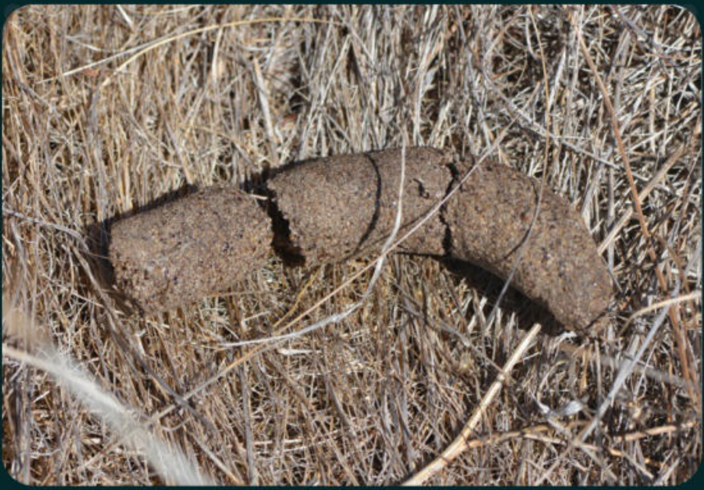


Image: Tahlia Perry

"They also look like they glitter in the sun, because they're full of ant and termite exoskeletons," Tahlia adds.

If you find any of these poos in the wild, follow the instructions on the EchidnaCSI project page on iNaturalist. You can then ship the scat to the researchers so they can analyse it.

TO BE AN ECHIDNA INVESTIGATOR, YOU WILL NEED

- A smart phone connected to the internet (a parent's phone is fine)
- Walking shoes
- Plastic zip-lock bags for storing scats
- Tongs or gloves for picking up scats
- A place to look for echidnas*

* You can use local wildlife guides or check the Atlas of Living Australia online to find where echidnas are most commonly found near you.

WHAT TO DO

1. Look for 'iNaturalist' on the App Store or Google Play and fill in your details – ask your parents to help if you need.
2. In the iNaturalist app, go to the 'Projects' tab, search for 'EchidnaCSI' and join the project.
3. Head out for a walk in an area with echidnas.
4. Start searching for echidnas and their poo. Listen carefully, as you are more likely to hear echidnas rustling through grass and leaves before you see them.
5. If you find any poo, take a photo via the app and log any information.
6. Pick up the poo (don't touch! Use tongs or gloves) and bag it up for the researchers. They'll ask you to mail it to them.

WHAT'S HAPPENING?

Echidnas are usually masters of hide and seek, but we can learn about them through indirect ways, such as scats. Through DNA analysis, scientists can investigate how echidnas are related to one another, what food they've eaten compared with their friends, and whether they are pregnant. That's a lot of stinkingly good information!

Image: Tahlia Perry

HOLEY EGGS

BY CHENXIN TU

ALL ANIMALS NEED OXYGEN TO SURVIVE – EVEN BABIES. SO HOW DO BABY BIRDS BREATHE WHILE THEY'RE STILL INSIDE THE EGG?

Image: ©iStock.com/Danakia

YOU WILL NEED

- A few store-bought eggs (any poultry egg)
- Food dye
- Dishwashing detergent
- Water
- A container
- Bowl

WHAT TO DO

1. Take a few eggs out of the carton. Try to use older eggs if possible – this activity doesn't work as well with very fresh eggs.
2. Place the eggs in a container and fill it with enough water to cover the eggs.

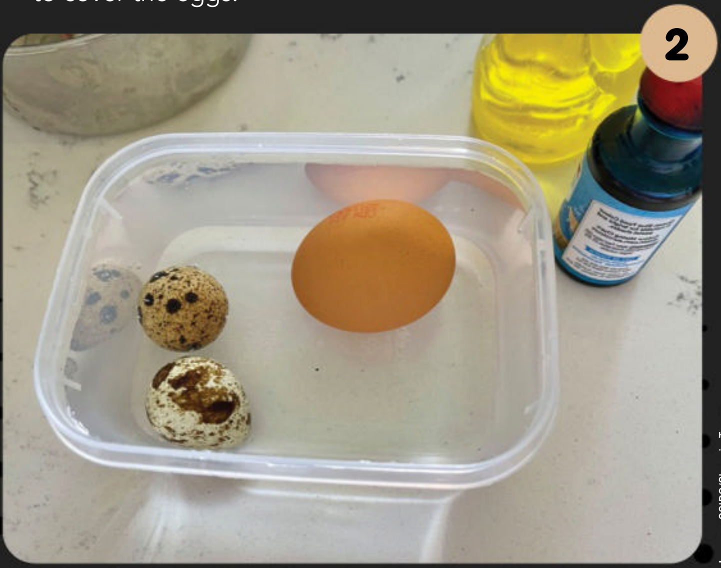


Image: CSIRO/Chenxin Tu

3. Add a teaspoon of dishwashing detergent to the container.

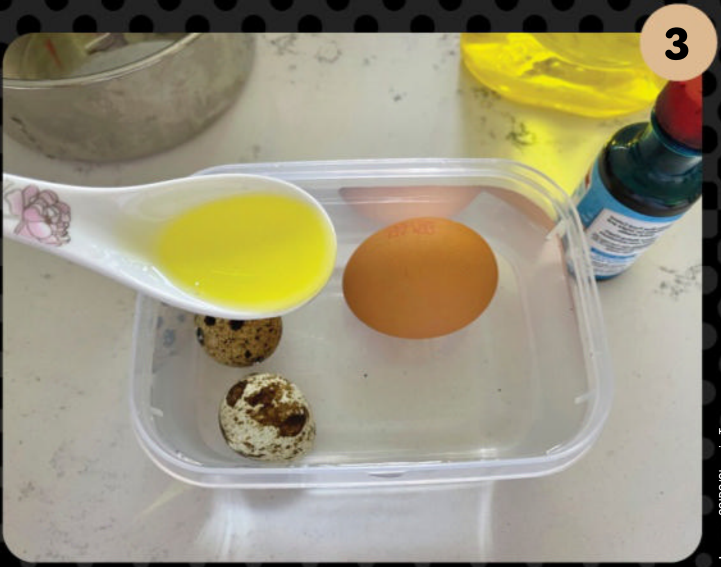


Image: CSIRO/Chenxin Tu

4. Add a teaspoon of food dye to the container.

4

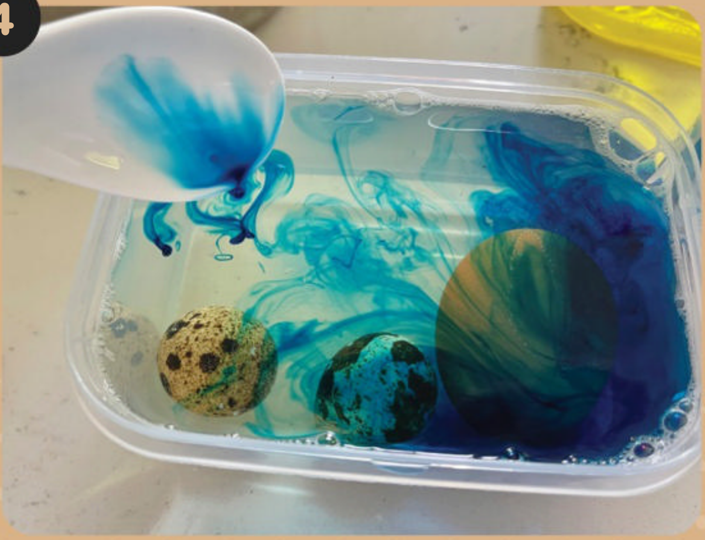


Image: CSIRO/Chenxin Tu

5. Leave the mixture overnight.

6. Carefully take the eggs out of the container, and then pour the liquid down the sink.

7. Crack the eggs into a bowl. What can you see on the inside of the shell? Are there any differences between different eggs, or different types of eggs?

7

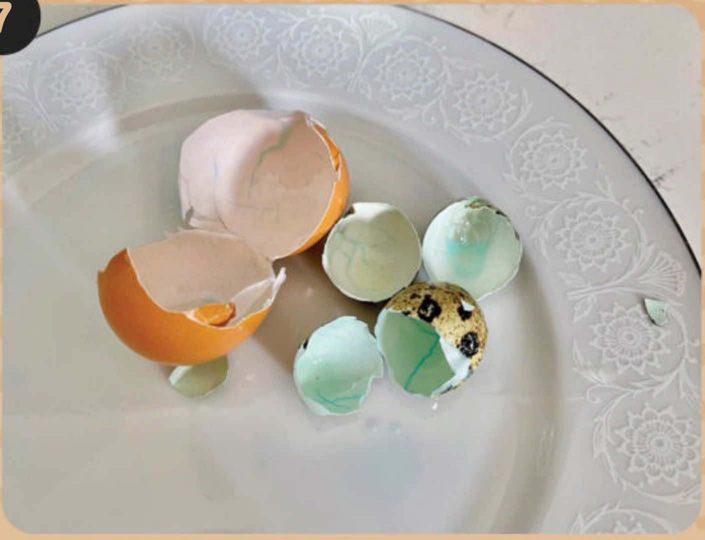


Image: CSIRO/Chenxin Tu

8. Throw the eggs into the bin or the compost and wash your hands thoroughly. The eggs are no longer edible, because they have detergent in them.

WHAT'S HAPPENING?

Coloured water has entered your eggs! And it got there because eggs are designed to protect the chicks inside them.

All animals need to breathe. Humans breathe with lungs, fish with their gills, and earthworms through their skin. Baby animals inside eggs have their own ways of breathing.

Eggs contain lots tiny holes, called pores. A single chicken egg has more than 7,000! The pores allow fresh air to get in and carbon dioxide to get out. In this activity, the pores allowed the food dye to get into the egg, making coloured dots on the shell.

You might also spot lines or pools of coloured water inside the egg, showing that quite a bit of water entered. You might think that eggs are completely full of yolk and white, but there's actually a bit of space in there too.

When an egg is laid, it is usually warmer than the surrounding air. As it cools, the eggy contents inside the shell shrink, creating a small sac full of air between the shell and its inner layer, called a membrane. The shell membrane is the white layer that looks like tissue paper. The air sac provides the space for a chick to breathe (and space for coloured water to collect too!).

Image: ©iStock.com/MWayOut

Can you spot the pores on this gigantic ostrich egg?

WHAT FLOATS A SHARK?

BY CHENXIN TU

A SINGLE SHARK CAN WEIGH BETWEEN 680 AND 1,800 KILOGRAMS, WITH HEAVIEST SHARK WEIGHING UP TO 19 TONNES! IN THIS ACTIVITY, YOU WILL FIND OUT WHAT HELPS HEAVY SHARKS FLOAT IN WATER.

Image: ©iStock.com/Philip Thurston

YOU WILL NEED

- 2 balloons
- Bucket or large bowl
- Vegetable oil
- Water
- Permanent marker
- Someone to help

WHAT TO DO

1. Add water to the bucket or container until it is about halfway to three-quarters full.
2. Fill a balloon with water from the tap. You don't need to inflate it – you want a fist-sized balloon.
3. When the balloon is full up to the neck, carefully tie it off. This step is hard, so you can ask an adult to help.
4. Hold the second balloon open and ask your helper to fill it up with vegetable oil. Then tie it off – once again, if you find it tricky, ask for help.

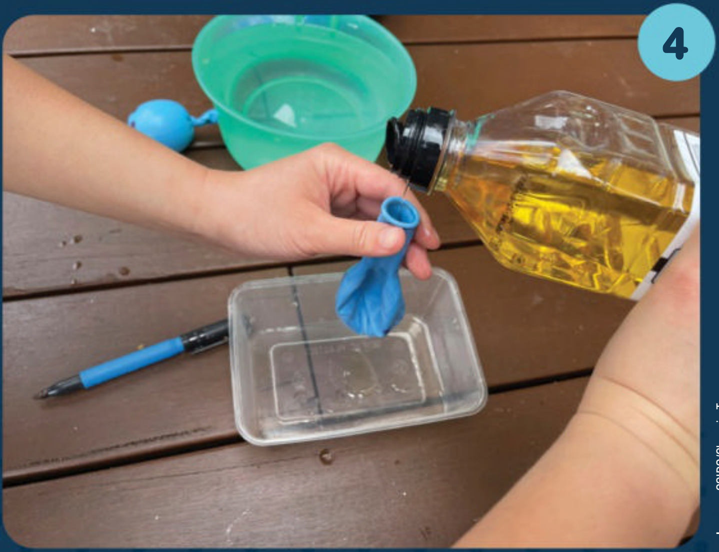


Image: CSIRO/Chenxin Tu

5. Label the water balloon and the oil balloon so you can tell them apart. You can draw faces and fins on them too, if you want to make them look more like sharks!

Image: CSIRO/Chenxin Tu

6. Place the balloons into the bucket or bowl of water.
7. Can you see which balloon is sinking and which one is floating?

7

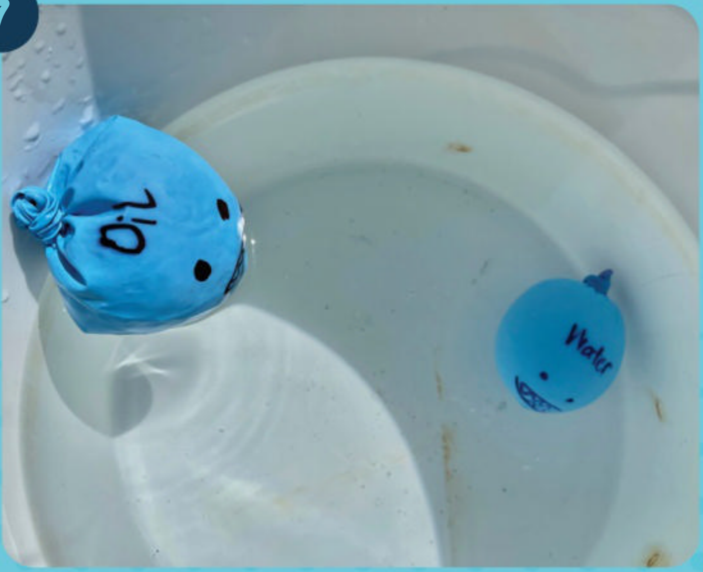


Image: CSIRO/Chenxin Tu

8. Wash your hands thoroughly after this activity and dispose of the balloons in a bin. Do not reuse the oil in the balloon.

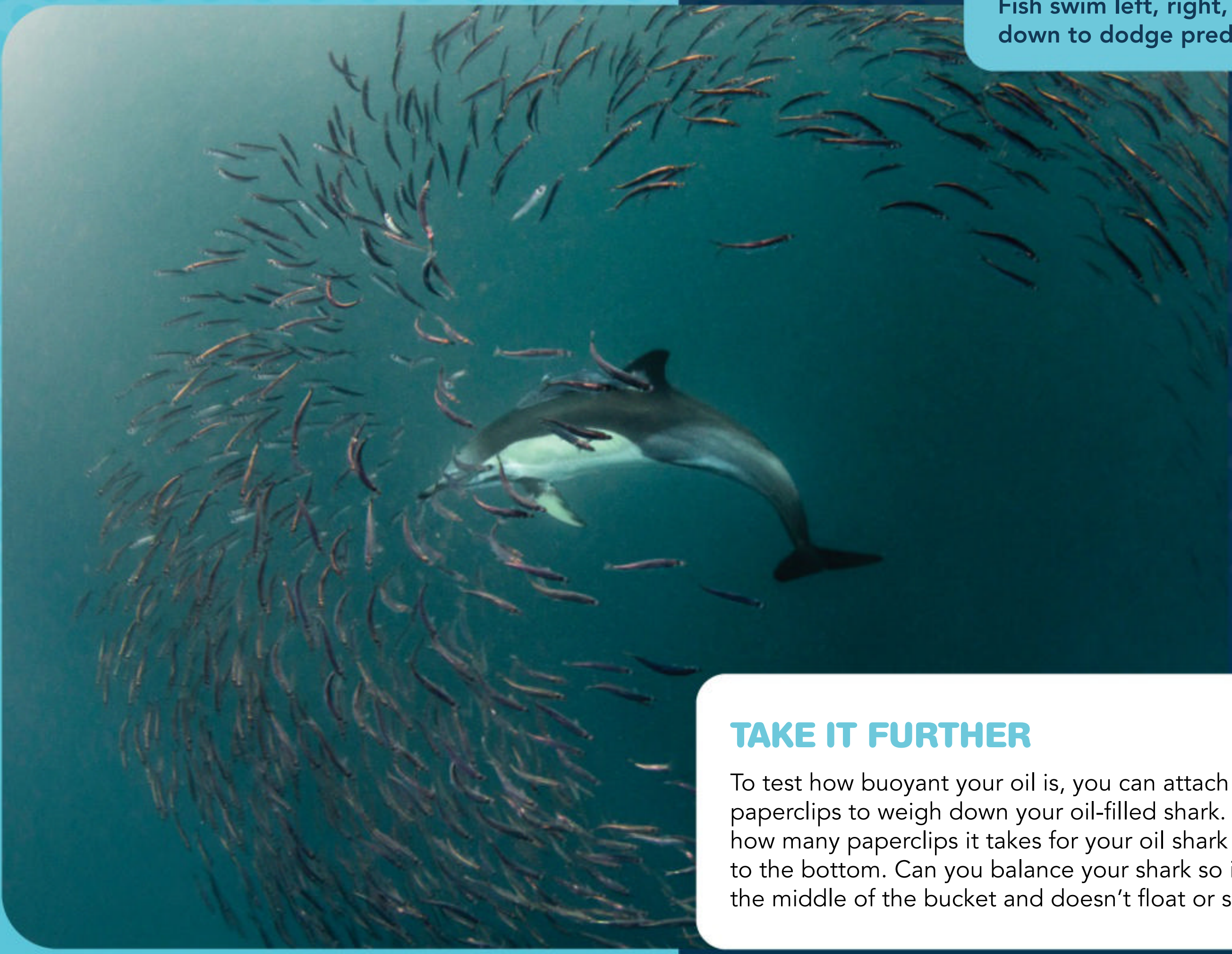
WHAT'S HAPPENING?

Fish have fins to turn with and tails to push them forwards. But how do they go up and down? The secret is buoyancy.

Buoyancy is the ability of something to float. Fish skeletons and muscles aren't buoyant – they are dense and will sink. So, fish need something buoyant to balance the heavy parts of their bodies.

Many bony fish have an organ called a swim bladder, which contains gas that helps them float. The gas is very buoyant, and fish can add or remove gas from their swim bladder to keep them at just the right buoyancy. That way they can stay in the middle of the water, not floating on the top or sinking to the bottom!

Sharks don't have swim bladders. Instead, they have oily livers to give them some buoyancy! In this activity, the oil-filled balloon floats just above the surface of the water. It's buoyant, but only a little bit. To get the right amount of buoyancy, sharks need a lot of oil. A shark's liver can take up one-quarter of the space inside its body!



Fish swim left, right, up and down to dodge predators

Image: ©iStock.com/atese

TAKE IT FURTHER

To test how buoyant your oil is, you can attach some paperclips to weigh down your oil-filled shark. See how many paperclips it takes for your oil shark to sink to the bottom. Can you balance your shark so it sits in the middle of the bucket and doesn't float or sink?

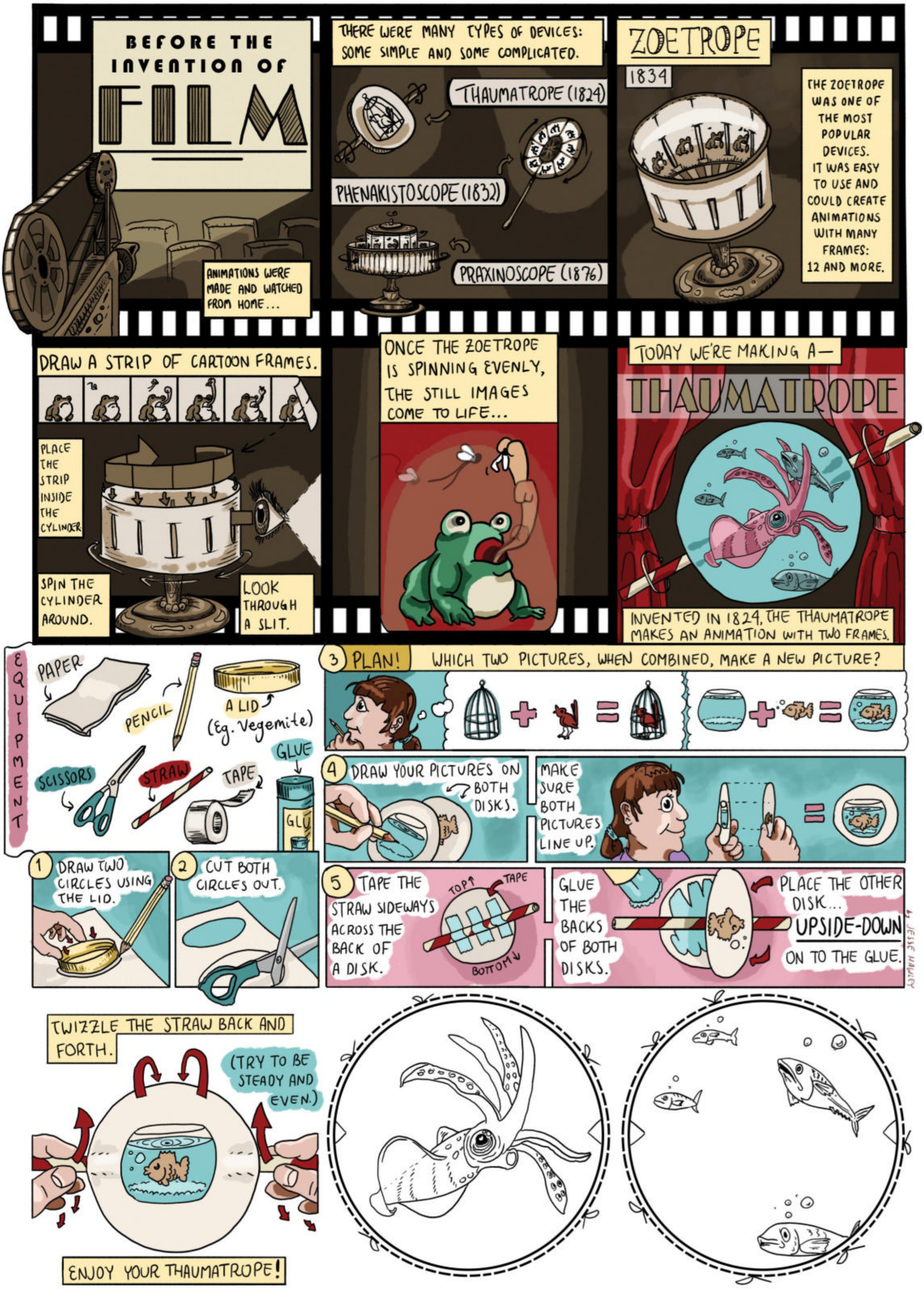

BEFORE THE INVENTION OF FILM
ANIMATIONS WERE MADE AND WATCHED FROM HOME...
THERE WERE MANY TYPES OF DEVICES: SOME SIMPLE AND SOME COMPLICATED.
THAUMATROPE (1824)
PHENAKISTOSCOPE (1832)
PRAXINOSCOPE (1876)
ZOETROPE
1834
THE ZOETROPE WAS ONE OF THE MOST POPULAR DEVICES. IT WAS EASY TO USE AND COULD CREATE ANIMATIONS WITH MANY FRAMES: 12 AND MORE.
DRAW A STRIP OF CARTOON FRAMES.
PLACE THE STRIP INSIDE THE CYLINDER
SPIN THE CYLINDER AROUND.
LOOK THROUGH A SLIT.
ONCE THE ZOETROPE IS SPINNING EVENLY, THE STILL IMAGES COME TO LIFE...
TODAY WE'RE MAKING A—
THAUMATROPE
INVENTED IN 1824, THE THAUMATROPE MAKES AN ANIMATION WITH TWO FRAMES.
EQUIPMENT
PAPER
PENCIL
A LID (Eg. Vegemite)
SCISSORS
STRAW
TAPE
GLUE
GLU
1 DRAW TWO CIRCLES USING THE LID.
2 CUT BOTH CIRCLES OUT.
3 PLAN! WHICH TWO PICTURES, WHEN COMBINED, MAKE A NEW PICTURE?
4 DRAW YOUR PICTURES ON BOTH DISKS.
MAKE SURE BOTH PICTURES LINE UP.
5 TAPE THE STRAW SIDEWAYS ACROSS THE BACK OF A DISK.
TOP
TAPE
BOTTOM
GLUE THE BACKS OF BOTH DISKS.
PLACE THE OTHER DISK... UPSIDE-DOWN ON TO THE GLUE.
by JESSE HAWLEY
TWIZZLE THE STRAW BACK AND FORTH.
(TRY TO BE STEADY AND EVEN.)
ENJOY YOUR THAUMATROPE!

Image: Jesse Hawley

PUZZLES BY CHENXIN TU
ANSWERS ON PAGE 39

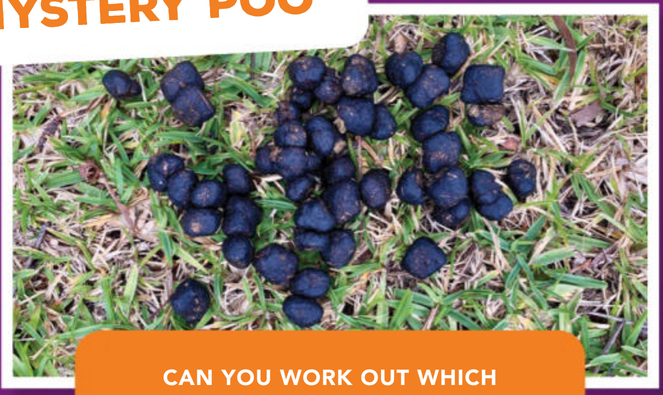
WHOSE POO?

DIFFICULTY: FUN

Poo? You say euw, scientists say cool!

Animal poo is known as scat, and it's very useful! Its size, shape and colour gives scientists clues about which animal produced it, and when. Sometimes you can even see what the animal had for its previous meal.

MYSTERY POO



CAN YOU WORK OUT WHICH ANIMAL DID THIS POO?

Image: ©iStock/Kiara Bloom

WOMBAT

Image: ©iStock/CraigRJD

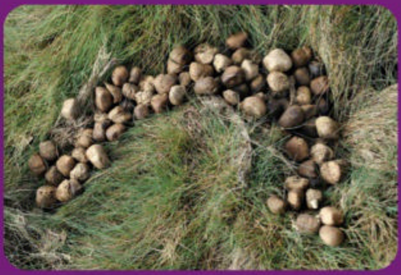


Image: ©iStock/keichiihiki

The wombat has cube-shaped poo that is about 2–3 centimetres wide. Wombats mostly eat grass, but sometimes dig up roots too.

ECHIDNA

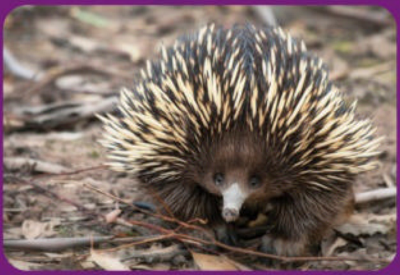


Image: ©iStock/KristianBell

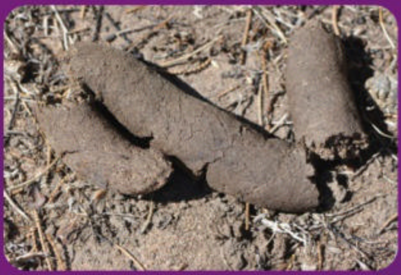


Image: Courtesy of Tahlia Perry

Echidnas have dirt-coloured poo that looks like a long tube about 1–2 centimetres wide. The echidna loves to feast on ants and termites.

KANGAROO

Image: ©iStock/samvaltenbergs

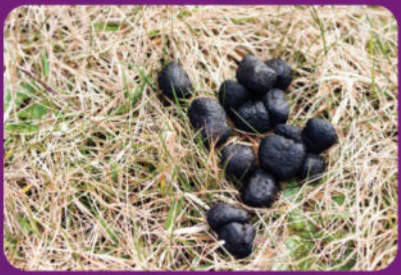


Image: ©iStock/imamember

Kangaroo poos are unevenly shaped balls about 1–3 centimetres across. They are usually scattered about in small piles or lines, and usually look black, but can turn yellowish–green when dry. Kangaroos mostly eat grass and leaves.

POSSUM

Image: ©iStock/seraphic06

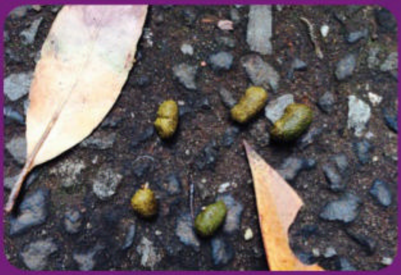


Image: Flickr/Doug Beckers CC BY-SA 2.

Possum poo is shaped like a Tic-Tac, about 0.5 –1 centimetres wide. It varies in colour from green to black. Possums eat all sorts of leaves, buds, seeds and fruits.

A WEIGHTY PROBLEM

DIFFICULTY: TRICKY

Four animals (a dog, twin cats and a rabbit) have arrived at the animal shelter. They have all been weighed, but not individually. The cats both weigh the same. Can you work out the weight of each animal?

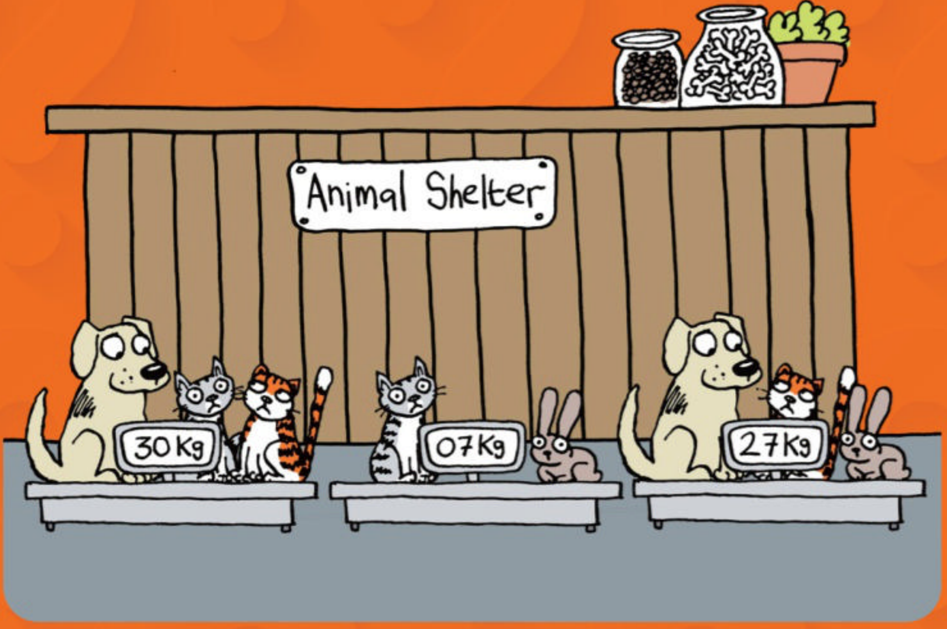

Animal Shelter
30 Kg
07 Kg
27 Kg

Image: Alex Hallatt

MOSAIC MADNESS

DIFFICULTY: FUN

An animal is hiding in the square. To reveal it, leave areas with an answer less than 10 blank. Colour regions with answers from 11 to 20 yellow, and regions with answers from 21 to 30 blue.

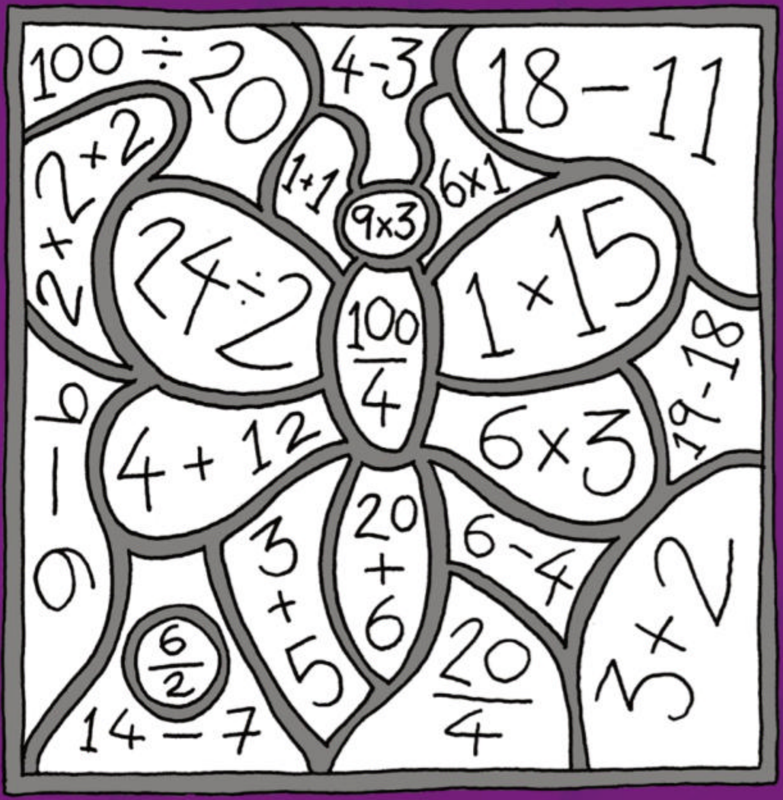
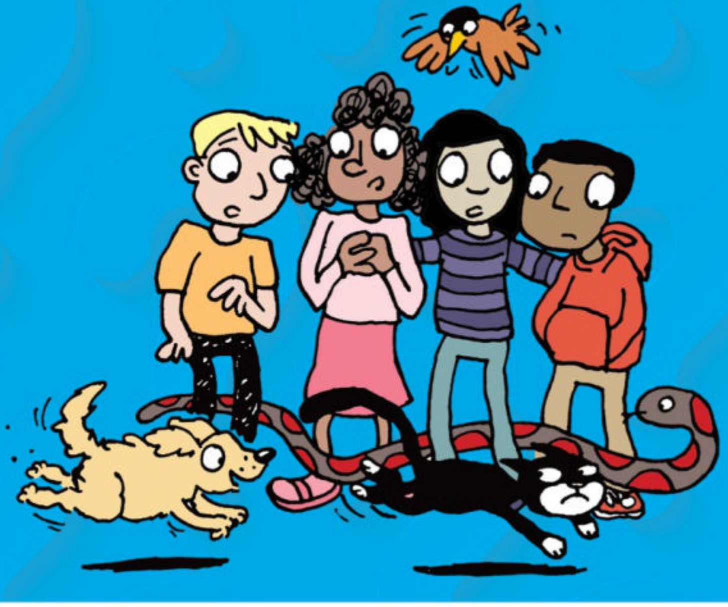

100 ÷ 20
4-3
18 − 11
2+2
1+1
9x3
6x1
24 ÷ 2
100/4
1×15
9 − 6
19-18
4 + 12
6×3
3+5
20+6
6-4
6/2
20/4
3×2
14 − 7

Image: Alex Hallatt

PET PUZZLER

DIFFICULTY: FUN

Four children each own one pet: a dog, a cat, a bird and a snake. Levi has an animal with 4 legs. Neither girl has a mammal. Chloe's pet has tried eating Sofia's pet. Combining Bob's name and his pet type makes a word that is both an animal and a machine. Which pet belongs to each child?



ANIMAL SCRAMBLE

DIFFICULTY: TRICKY

How many Australian animal names can you find in the square? Letters don't need to be next to each other in the grid, but you can only use each box once per word. So, you can use 2 Ps in a word, but you can only use one K.

K	N	O	W	B
D	O	R	Y	P
I	G	A	E	U
M	T	P	L	S
C	H	S	G	A

How did you do?
5 animals: good, 10 animals: great,
15 animals: excellent, 20 or more animals: amazing!

QUICK QUIZ

DIFFICULTY: TRICKY

1. True or false? Bamboo is a type of tree.
2. Australia's mountain ash is the world's second-tallest tree species. How high is the tallest mountain ash? Is it a) 192 metres, b) 1000 metres, c) 15.8 metres, or d) 100.5 metres tall?
3. What are baby echidnas called? Are they a) piglets, b) puggles, c) goslings, or d) joeys?
4. Is lepidopterophobia the fear of a) dogs, b) spiders, c) butterflies, or d) worms?
5. Which Australian bird is known for its laugh? Is it a) black cockatoo, b) kookaburra, c) noisy miner, or d) rainbow lorikeet?

BRAIN TEASER

DIFFICULTY: FUN!

Amelia was cleaning her room. She realised she had 50 books to give away.

She gave away 14 books to her friend Samuel, and kept the rest for herself.

Later, her cousin Mason asked for a few books too, leaving Amelia with 20 books.

How many books did she give to Mason?

JUST FOR LAUGHS

Q: Why is the leopard so bad at hide and seek?
A: Because he is always spotted.

Q: Why do cats always get to have whatever they want?
A: They make purrrrr-suasive cases.

Q: What time did the duck get up?
A: At the quack of dawn!

Q: How do bees get to school?
A: On the school buzz.

PRIZES

WWF
puzzle
1000 pcs.

SEA HELPERS

Turtles are beautiful sea creatures, and they're really important to the reefs and oceans they live in. This World Wildlife Fund Sea Turtle jigsaw puzzle showcases turtles of all ages, from babies to adults.

For your chance to win a World Wildlife Fund Sea Turtle jigsaw puzzle from Axis Toys (axistoys.com), send us a poem about your favourite marine animal. The best poet will win the prize!

QUIET PLEASE!

Australia has about 2,000 species of native bee. A handful of these live in hives, but most native bees live in holes, alone or in small groups. This bee hotel has lots of holes for bees to nest in!

To win a bee hotel, send us your best drawing of a native bee and tell us which bee it is! We're looking for a really detailed picture, with the proper scientific name included.

WELCOME
WELCOME

Exploring the Abyss
CREATURES OF THE DEEP
TRIPODFISH
CREATURES OF THE DEEP

CREATURES OF THE DEEP

CSIRO's research vessel (RV) *Investigator* lets scientists explore the deep sea and discover amazing and unique marine creatures. The Royal Australian Mint is celebrating the RV *Investigator* and its discoveries with this 2023 Mintmark and Privy Mark Four-Coin Set.

For your chance to win a Creatures of the Deep coin collection, write a riddle about a sea creature and include the answer. The 2 most original riddlers will win!

HAVE YOUR SAY AND WIN!

How are you enjoying Double Helix magazine? We've come up with some questions to find out how we can make our magazine even better. From future themes to design ideas, we can't wait to hear your thoughts!

If you complete the survey, you can enter a competition to win a Sphero Mini Activity Kit. Sphero Mini is an ultra-compact robot that you can control and program yourself. The kit comes with accessories such as mini traffic cones, bowling pins and a 28-piece construction set. It's compatible with iOS, Android, Kindle, Mac, Windows and Chrome.

Visit www.surveymonkey.com/r/DHsurvey2023 and complete the survey for a chance to win a Sphero Mini Activity Kit.

ENTRIES DUE 31 MAY 2023!

HOW TO WIN

To be in the running to win one of these fantastic prizes, photograph your entry and email it to helixassist@csiro.au. Include your name, age and address. Get a parent's permission, and ask them to sign each entry. The best entries in each competition will win.

Terms and conditions of entry 1. To be valid, all entries must include entrant's name, age, and address 2. Entering the competition assigns copyright to CSIRO. 3. Entries will be judged on creative merit, not by chance. 4. Age will be taken into consideration when judging. 5. All decisions on competitions are final and will not be discussed further. 6. Winners will be notified by email and the names of competition winners only will be published 3 issues later. 7. CSIRO shall not be liable for any damage or loss suffered in connection with any of the prizes. 8. Any change in value of the prize between the publishing date and the delivery date is not the responsibility of CSIRO. 9. In the case that prizes become unavailable after the publishing date, CSIRO will send an alternative prize. 10. The closing date for this issue's entries is 31 May 2023. 11. Competition entries must be the entrant's own work. 12. It is the responsibility of the entrant to ensure copyright of their entry is not assigned elsewhere. 13. We will contact winners regarding the timing of prize delivery. 14. Your privacy is important to us. For information on how CSIRO uses your personal details, see page 2.

Winners! ***Double Helix* Issue 60. Amazing evolution:** Evelyn Kwok, Ruben Bertakis, Lola Morrow, George Brix **Cool coding:** Rory Mansell **Robot humour:** Madeleine Potter

TURN THE PAGE UPSIDE DOWN
TO READ THE...

ANSWERS

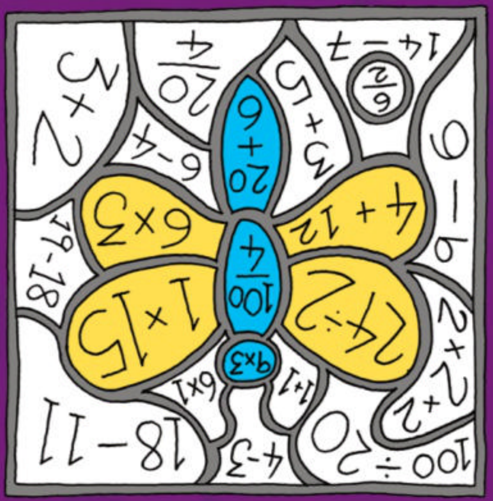
WHOSE POO?

The mystery poo came from a kangaroo.

A WEIGHTY PROBLEM

Dog: 20 kilograms, cat: 5 kilograms, rabbit: 2 kilograms

MOSAIC MADNESS



PET PUZZLER

Levi has a dog, Bob has a cat, Sofia has a bird and Chloe has a snake.

ANIMAL SCRAMBLE

Koala, dingo, wombat, platypus, emu, echidna, dugong, magpie, kangaroo, pelican, bandicoot, dolphin, brolga, barn owl, cassowary, seal, galah, shark, ant, numbat, possum, spider, whale, stingray, crab and many more!

QUICK QUIZ

1. Bamboo is actually a grass, not a tree! **2.** d) Last time it was measured, the Tasmanian mountain ash tree named 'Centurion' was 100.5 metres tall! **3.** b) Baby echidnas are called puggles. **4.** c) Lepidopterophobia is the fear of butterflies. **5.** b) Kookaburras are famous for their laughs.

BRAINTEASER

Amelia began with 50 books, and she gave away 14 books to Samuel.

50 − 14 = 36 books

After that, Amelia had 20 books left after giving some to Mason.

36 − 20 = 16 books for Mason.

Curious Kids – it starts with science!

INSPIRING BOOKS FROM CSIRO PUBLISHING

ROCKS, FOSSILS AND FORMATIONS
DISCOVERIES THROUGH TIME
THE ENCYCLOPEDIA OF STEM WORDS
An Illustrated A to Z of 100 Terms for Kids to Know
Written by JENNY JACOBY
Alight
A Story of Fire and Nature
Sam Lloyd
HOW TO SURVIVE ON MARS
Jasmina Lazendic-Galloway
OCEANS of PLASTIC
UNDERSTANDING AND SOLVING A POLLUTION PROBLEM
THE COMPACT Australian BIRD GUIDE
Jeff Davies
Peter Menkhorst
Danny Rogers
Rohan Clarke
Peter Marsack
Kim Franklin
Christopher Cheng and Danny Snell
POLLINATION
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